one

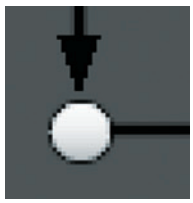
CHAPTER

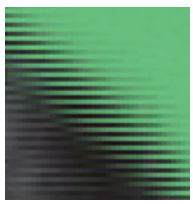
Setting Up a Composite

"Education is important—I think people need to make sure that they're learning to be artists and not just learning tools."

—Gianni Aliotti, lead lighter, DreamWorks Animation

Before beginning a composite, *it's important to understand the fundamental differences between layer- and node-based compositing systems. A strong knowledge of common image resolutions and frame rates will allow you to make correct decisions. Once the fundamentals are grasped, setting up a compositing project or script becomes fairly easy. Since this book uses both After Effects and Nuke, you will be required to learn two different workflows. However, if you master both, you will be well suited for work in the feature animation, visual effects, and commercial production industries. To add perspective to the lessons, professional compositing examples are included. In addition, the first 3 of 19 interviews with professional compositing supervisors, lead compositors, and compositing experts are added at the end of this chapter. Two tutorials are also provided to get you started in After Effects and Nuke.*





Compositing Challenge

Digital compositing is the process of digitally assembling multiple images or image sequences into a single piece of motion picture or digital video footage. The goal of a successful digital composite is to make the source material appear as if it has always existed in the same location or scene. Digital compositing is closely related to photomontage and compositing (without the word *digital*). *Photomontage* is the process of cutting apart, reassembling, and rephotographing photographic prints. *Compositing*, as it's used for professional photography, is the digital assembly of still images; compositing, when used this way, is often referred to as *Photoshopping*. The compositing and composites mentioned in this book refer to digital compositing. Professional digital compositors are simply known as *compositors*.

While this book focuses on the theoretical and technical aspects of digital compositing, it dedicates a limited amount of space to the aesthetic component. Ultimately, the success of a composite does not rely solely on specific effects or nodes. Instead, a successful composite makes a particular shot *look real* or *appear attractive*. If the composite is a visual effect, then the goal is to make all the elements (background plate, computer graphics [CG] renders, matte paintings, and so on) look like they exist in a real-world location. If the composite is for feature animation and the sets and characters are fantastic, the goal is to make the elements visually interesting yet, at the same time, plausible for the world fabricated by the story. If the composite uses abstracted motion graphics and text for a commercial, the goal is to make the elements fascinating, exciting, or just plain worth watching.

Whatever the destination of the composite, it always pays to study related fields. In particular, photography, cinematography, stage and film lighting, and classic painting will help you develop an eye for what works. Composition, color balance, light quality, and shadow quality are important aspects of these fields and are equally applicable to compositing. As you follow the step-by-step guides and tutorials in this book, ask yourself how each composite can be improved. Not only are there many different approaches to each compositing task, there also are numerous ways to fine-tune any given shot.

Compositing Examples

If you are fairly new to compositing, it may be difficult to imagine what types of footage, rendered elements, or layers are regularly combined. As such, several examples are included in this chapter. All the listed techniques are demonstrated in the various chapters of this book.

Freestyle Collective for Cartoon Network

Figure 1.1 shows eight steps of an After Effects composite created by Entae Kim at Freestyle Collective, a collaborative design and production studio in New York City. (To read an interview with Entae Kim, see Chapter 7, "Masking, Rotoscoping, and Motion Tracking.") The composite is one shot of an extended network ID (identification) that features popular Cartoon Network characters battling each other. The breakdown is as follows:

1. A gradient is used to create a sky. Stock images of clouds are added with transparency.
2. A CG render of a city block is imported as a layer.
3. A CG robot is imported as a layer. Although the render has self-shadowing, there is limited specularity.
4. A specular render pass and decal render pass of the robot are blended with the original robot layer. The result is color graded to create greater contrast. In addition, a new CG ground plane with debris is placed on top.

5. The ground plane layer is color graded to make it lighter. In addition, a CG female warrior is brought in as a layer. At this point, it's difficult to see the warrior over the background.
6. The warrior layer is color graded. A smoke render is sandwiched between the foreground and the robot. A glow render is added to the end of the warrior's weapon.
7. A smoke render is added to the foreground as a top layer. CG lasers and starbursts are imported.
8. Environmental fog is added to the background to make the foreground characters easier to see. The CG buildings are also blurred. All the layers are color graded toward a sepia tone and are given artificial film grain and dirt.

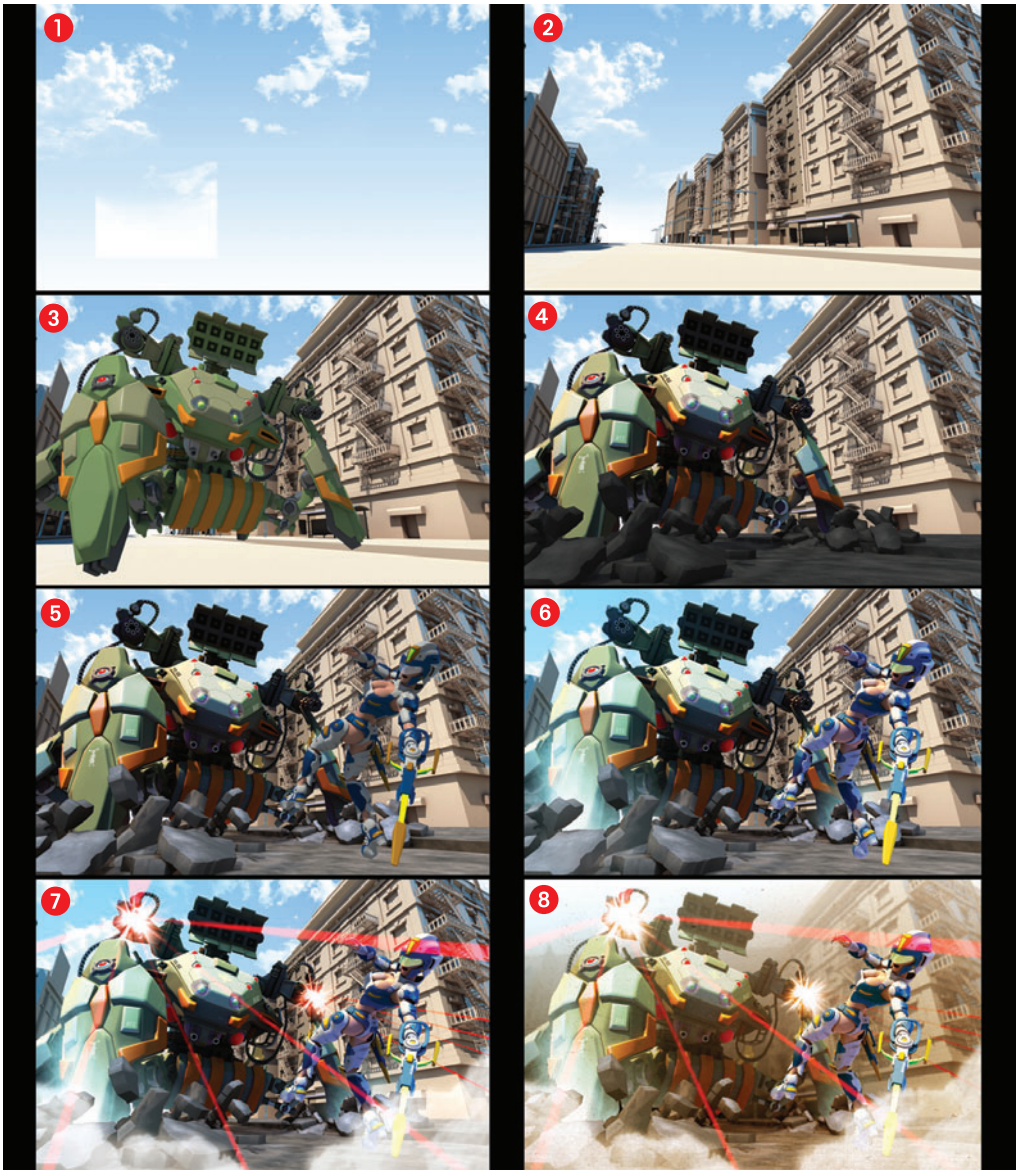


Figure 1.1 *Eight compositing steps used by Freestyle Collective to create a network ID for Cartoon Network (Images courtesy of Freestyle Collective)*

Click 3X for Sharp

Figure 1.2 shows five steps of a Flame composite created by Aaron Vasquez at Click 3X, a motion graphics and visual effects studio in New York City. (To read an interview with Aaron Vasquez, see Chapter 11, "Working with 2.5D and 3D.") The composite is one shot of a commercial for Sharp featuring the Aquos television. The breakdown is as follows:

1. A peacock is filmed against greenscreen. The bird slowly rotates on a turntable.
2. The peacock footage is motion tracked. The tracking information is brought into Flame and applied to a 3D camera. Simple geometry is added to the background in the composite. (Flame provides geometry primitives and is able to import geometry files.) After greenscreen removal, the peacock footage is placed over the background. Since the 3D camera uses tracking information from the footage, it dollies at an appropriate speed and perspective to fit the background to the peacock. Hence, the 3D background doesn't slide under the peacock's feet. A shadow is created by offsetting, transforming, and darkening the peacock footage. The body of the bird is removed and replaced by a CG body, thus creating different color feathers. The motion tracking data ensures that the CG fits tightly to the bird.
3. A prop tail, shot against greenscreen, is brought into the composite and layered to create new tail feathers for the peacock.
4. The layered feathers are fit to the body through spline warp tools and motion tracking. The deformation of the feathers is animated over time to create the illusion of rustling. A separate iteration of the feathers is used to create an appropriately shaped shadow on the background.
5. New wing and neck feathers are fit to the body by spline warping and motion tracking CG renders. The resulting composite is merged with a CG render of a television and background. The final result is color graded.

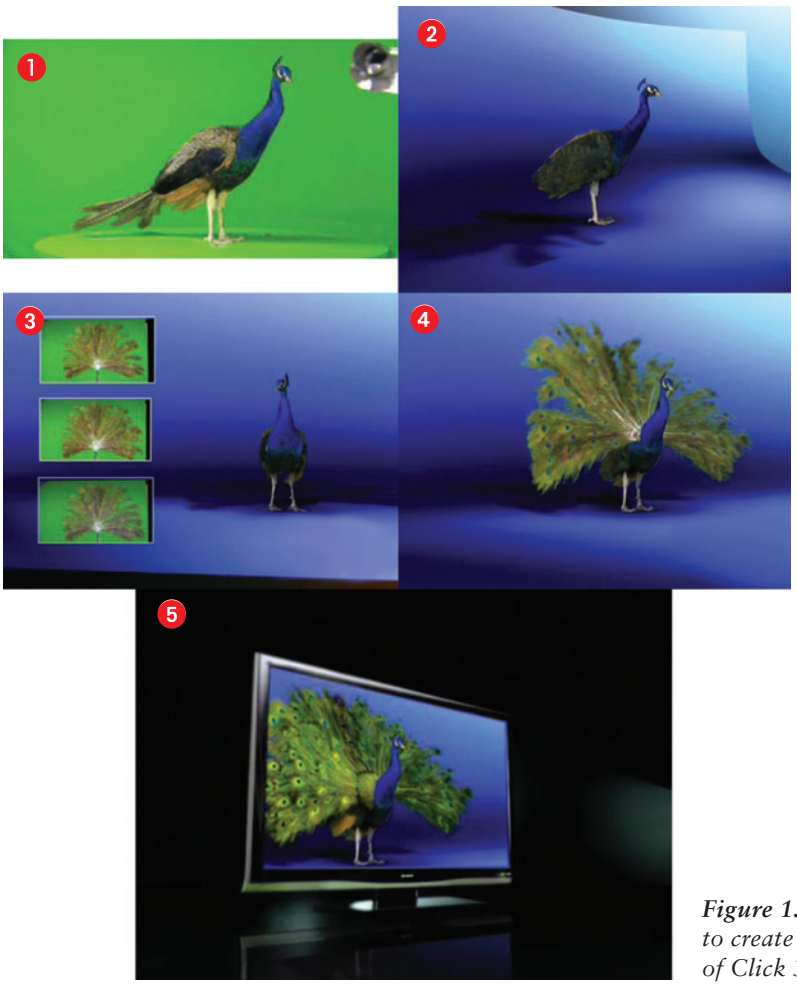


Figure 1.2 *Five compositing steps used by Click 3X to create a commercial for Sharp (Images courtesy of Click 3X)*

AILV for Spec Commercial

Figure 1.3 shows six steps of an After Effects composite created by the author and students at the Art Institute of Las Vegas (AILV). The composite is one shot of a spec commercial advertising a futuristic copier. (A *spec* is a demo used to show filmmaking or animation skills.) The breakdown is as follows:

1. An actress is shot against bluescreen.
2. Stock footage of a city is defocused (that is, blurred in an optically accurate way).
3. The bluescreen is removed from the footage of the actress. A scaled and transformed copy is given reduced opacity and a blur to emulate a window reflection. A texture bitmap is added with low opacity to create the illusion of dirt on the same window.
4. A CG render of a pillar is imported.
5. A single frame of the bluescreen footage is isolated. The frame is taken into Photoshop, color graded, and touched up to remove the wrinkles and seams on the tablecloth. The frame is imported back into the composite and placed on top of all the other layers.
6. The final composite combines the defocused city, the CG pillar, the fake window reflection, the actress, and the touched-up table. All the elements are color graded so that they work as a whole. A glow is added to create light wrap along the edges of objects in front of the window.

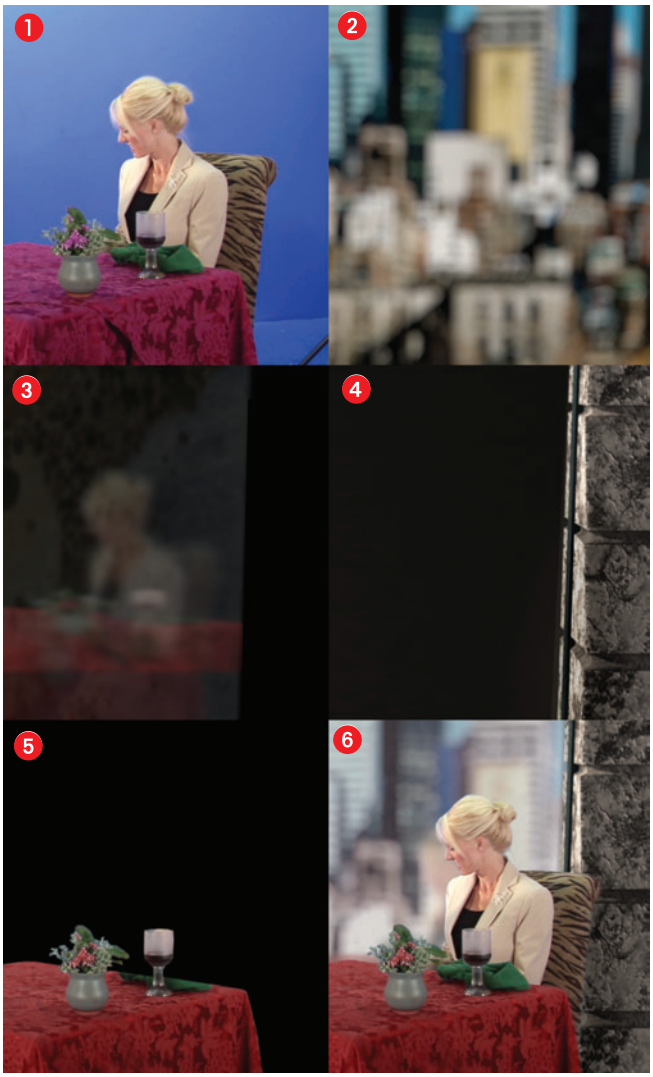


Figure 1.3 *Six compositing steps used by AILV to create a spec commercial*

Tonya Smay for Westchester Medical Center

Figure 1.4 shows two shots composited by Tonya Smay in After Effects for the Westchester Medical Center. Tonya works as a freelance compositor in the New York area. (To read an interview with Tonya Smay, see Chapter 12, "Advanced Techniques.") The breakdown is as follows:

1. A CG render of a medical center grounds, created in Maya, is brought into the composite as separate render passes. The camera is moving during the shot. The renders remain somewhat bare and are missing the sky.
2. A camera is exported out of Maya and imported into After Effects. In addition, several nulls, indicating specific locations within the model, are imported. The composite is converted to a 3D environment. Several 3D cards are set up with trees, bushes, water spray, and a sky. Because the composite uses a camera exported from the 3D program, the cards' motion follows the 3D render perfectly. To prevent occlusion

issues, RGB ID render passes of the model are imported and are converted to holdout mattes. ID passes offer a means to separate 3D objects. In this case, foreground, midground, and background objects are separated. The final composite is color graded. Depth of field is applied to the composite to soften the immediate foreground and background. Artificial glare is also added to make the daylight lighting appear more intense.

3. A CG render, featuring a medical lab, is imported into the composite. Although convincing, it lacks people.
4. Two actors are shot against greenscreen. After greenscreen removal and additional rotoscoping, they are imported into the composite. To allow the central actor to appear as if he's walking across the floor, the composite is converted to a 3D environment. The footage of the central actor is converted into a 3D card and is animated moving across the z-axis. To help sell the effect, reflections for each leg are applied to separate cards and are animated individually. To create the reflections, copies of the actor footage layer are vertically inverted and masked.

Figure 1.4 *Before and after images of two shots composited by Tonya Smay for a medical center commercial (Images courtesy of Tonya Smay)*

Layers vs. Nodes

After Effects and Nuke exemplify the two major approaches to compositing: layer based and node based. Layer-based programs represent each imported and utilized digital still or image sequence as a layer along a timeline. Each layer possesses its own set of transformations and special-effect filters. The layers are stacked and processed in order from bottom to top (see Figure 1.5). If there are three layers, the bottom layer and middle layer are blended and then the result is blended with the top layer.

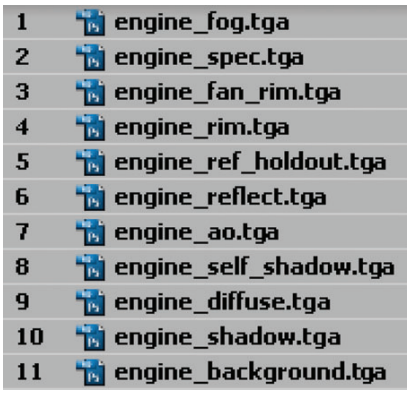


Figure 1.5 *The layer outline in the Timeline panel of After Effects. The 11 layers are processed in order from bottom to top.*

Node-based programs, on the other hand, represent each imported and utilized digital still or image sequence as a node. The output of a node is connected to the inputs of other nodes, which may be special-effect filters, input/output controls, and viewers (see Figure 1.6). Any given node accepts a limited number of inputs. However, the output of a node may be connected to an almost unlimited number of nodes through their inputs. *Node*, as a term, refers to a discrete unit used to build linked data structures. The data structure in Nuke and similar node-based programs is referred to as a *tree graph*, *node tree*, or *node network*. More specifically, the structure is a Directed Acyclic Graph (DAG), wherein data flows in one direction along the node connections. The direction is usually indicated by arrows.

There are several advantages to layer-based programs:

- Layers are intuitive to use. It's fairly easy to imagine the result of dropping one layer on top of another, particularly when the majority of digital artists are familiar with the Photoshop layer workflow.
- You can quickly set up a simple composite utilizing a limited number of layers. The same simple composite in a node-based program can require additional steps. For example, Nuke may require the addition of a Bezier node whereas After Effects automatically provides the Pen tool.
- When layers are stacked, they are merged automatically. A node-based program requires some type of merge node to supply the blending mathematics.

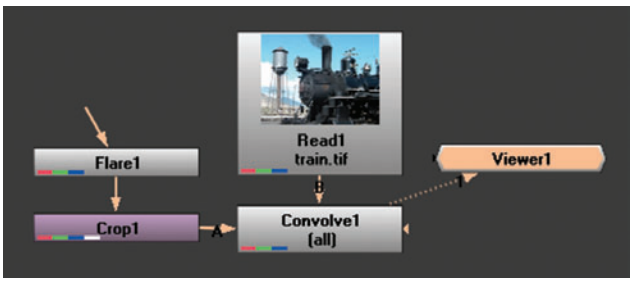


Figure 1.6 *A Nuke node network with five nodes. The arrows of the connection lines (pipes) indicate the direction information is flowing.*

There are several advantages to node-based programs:

- You can use the output of one node as the input to numerous other nodes. Although you can nest composites in a layer-based program, it becomes difficult to manage on complex projects.
- Once you are familiar with a node-based workflow, complex node networks are easy to interpret. Inputs and outputs in a node network are clearly indicated by node connection lines. With a complex layer-based composite, it becomes difficult to trace inputs and outputs because the main graphic representation only indicates position within a layer outline of a particular composite.
- Generally, node-based systems do not require precomposites, or *precomps*. Precomps are necessary with layer-based systems because it is difficult to send outputs of particular layers or filters to the inputs of other layers.
- High-end feature animation and visual effects work is generally created on node-based systems. Flame, Inferno, Shake, Fusion, Toxik, and Combustion are node based.

Industry Perspective: Compositing Software Overview

In preparation for this book, 19 expert compositors from feature animation studios, visual effects houses, and commercial production facilities in Los Angeles, New York, and San Francisco (as well as New Zealand and the United Kingdom) were interviewed. As such, a survey of popular compositing software was taken. The two most consistently named programs were Flame (or its sister, Inferno) and After Effects. These were followed by Shake and Nuke. Fusion, Toxik, and Combustion were used more sporadically. A few studios, including Sony Pictures Imageworks and DreamWorks Animation, continue to use proprietary compositing software.

Flame and Inferno are distributed by Autodesk and are prized for their real-time, high-resolution workflow. They are strongly favored in commercial production where clients prefer to sit in on color grading and other final adjustments. Seats of Flame and Inferno are extremely expensive and can run several hundred thousand dollars. Because of the expense and difficult maintenance of the Flame and Inferno systems, artists have traditionally learned them by apprenticing under an experienced compositor on site. Between the two programs, Inferno is considered the more advanced due to resolution independence and advances in hardware design.

After Effects is distributed by Adobe and is now bundled with its production set of software. It was developed in the early 1990s and was purchased by Adobe in 1994. Since that time, the After Effects interface has stayed fairly consistent, with minor adjustments accompanying every release. Because of its low price and ease of use, it is employed widely in various graphics-related fields by professionals, students, and hobbyists. That said, professional compositors at larger studios tend to employ it as a secondary compositing program. Of all the programs discussed in this section, After Effects is the only one that is layer based.

Shake was developed by a team of compositors at Sony Pictures Imageworks in the mid-1990s. In 2002, Apple purchased the software. Shake has been a preferred compositor in the visual effects industry due to its long-time support of high resolutions such as 2K, 4K, and IMAX. Shake supports 8-, 16-, and 32-bit workflows.

Nuke was developed by Digital Domain in 1993 as an in-house compositor. It was released to the public in 2002. In 2007, The Foundry, a London-based software distributor, took over the development of the program. Nuke has always enjoyed 32-bit floating-point architecture and has been ported to every major operating system. Although Nuke continues to be used by Digital Domain, it tends to be a secondary program at other animation studios. However, many compositors have found it to be a worthy replacement for Shake, which has suffered from lack of development in the last several years. At the time of this writing, several major studios, including Industrial Light & Magic and Weta Digital, have purchased site licenses for Nuke.

Fusion (previously known as Digital Fusion) is distributed by Eyeon Software Inc. and has found its niche in episodic television, feature visual effects, and the video game industry. Toxik is a relative newcomer to the Autodesk suite of programs and is aimed at high-resolution film and video work. In August 2009, Autodesk announced the integration of Toxik with Maya 2010; as such, the use of Toxik (which has been renamed Maya Composite) will likely become more widespread. Combustion, also distributed by Autodesk, has long been an inexpensive desktop rival to After Effects. Combustion is unique in that it is node based but offers a layer outline similar to After Effects. Combustion, due its architecture, is best suited for low-resolution projects.

Resolutions and Frame Rates

Compositors are faced with a wide array of image resolutions and frame rates. However, international broadcast standards and motion picture precedents make the choices logical for specific media.

Common Resolutions and Aspect Ratios

You can break image resolutions into three categories: SDTV, HDTV, and motion picture film. SDTV (Standard-Definition Television) includes broadcast television and video that possesses *fewer* than 720 lines of vertical resolution. SDTV may be analog or digital. HDTV (High-Definition Television) includes broadcast television and video that possesses 720 or more lines of vertical resolution. HDTV, as a newer format, is digital. Motion picture resolutions, on the other hand, are dependent on film scanner and film recorder technologies. Nevertheless, resolutions common to film scans are similar to resolutions captured by the latest generation of HD digital video cameras.

Video and broadcast television resolutions are determined by a number of international standards, including NTSC, PAL, SECAM, ATSC, and DVB. NTSC (National Television System Committee) is the standard for North America, Japan, South Korea, Taiwan, and parts of South America. PAL (Phase Alternating Line) is the standard for Europe, South America, Africa, India, Australia, and parts of the Pacific Rim. SECAM (SEquentiel Couleur Avec Mémoire) is the standard for France, Russia, and parts of Africa. PAL and SECAM use the same SDTV resolution and frame rate. ATSC (Advanced Television Systems Committee) is the digital broadcast successor for NTSC in North America. DVB (Digital Video Broadcasting) is the digital broadcast successor for PAL and SECAM in Europe, Australia, and parts of Africa.

Image aspect ratios are intrinsically linked to resolutions. An aspect ratio is represented as *x:y* or *x*, where *x* is the width and *y* is the height. For example, the SDTV aspect ratio can be written as 1.33:1 or 1.33. That is, SDTV has a width that's 1.33 times greater than its height. HDTV has an aspect ratio of 16:9 or 1.78. Mixing different aspect ratios leads to compositional problems. For example, broadcasting SDTV on a high-definition TV requires the footage to be stretched horizontally or letterboxed with two side bars. Broadcasting HDTV on an SDTV set requires the footage to be cropped at the sides or letterboxed with top and bottom bars. In terms of compositing, mixing footage with different aspect ratios necessitates additional transformations to fit the components together. (See the tutorials at the end of the chapter for more information.)

In addition, each resolution carries a specific Pixel Aspect Ratio (PAR). A PAR is the mathematical ratio between the pixel width and height. A square PAR has an equal width and height and is expressed as 1:1 or 1.0. A non-square PAR has an unequal width and height. Non-square PARs are feasible because television hardware is able to stretch non-square pixels into square pixels at the point of display. For example, NTSC SDTV has a PAR of 10:11, which is rounded off as 0.9. Thus, NTSC SDTV pixels are slightly taller than they are wide. As such, NTSC SDTV composites appear slightly "squished" on a computer monitor (which uses square pixels). However, once the NTSC SDTV composite is transferred to video and broadcast, the image appears normal.

A list of common resolutions follows. If the PAR is not listed, it's assumed to be 1.0.

640×480 The visible broadcast size of NTSC SDTV as well as a variation of ATSC EDTV (Enhanced Digital Television) is 640×480. In addition, 640×480 is a common size for web-based videos (in fact, it's sometimes called PC Video). A half-size version, 320×240, is often used for web-based video that is severely restricted by bandwidth.

NSTC and PAL D1 D1 (or D-1) was the first widely used digital video format. Although D1 is no longer common, its size is conducive to any compositing project destined for SDTV. The NTSC square-pixel version is 720×540. The NTSC non-square version is 720×486 with a PAR of 0.9. The non-square PAL version is 720×576 with a PAR

of 1.07. In contrast, D-3, D-5, and D-5 HD are newer digital formats developed by Panasonic. D-5 HD supports common HDTV resolutions and frame rates.

NTSC and PAL DV DV has been the standard for SDTV consumer digital video capture since the mid-1990s. The NSTC version is 720×480 with a PAR of 0.9. PAL DV is identical to PAL D1.

NTSC and PAL 16:9 Widescreen variations of D1 and DV are commonly called 16:9. The resolutions remain the same, but the NTSC PAR becomes 1.21 and the PAL PAR becomes 1.42.

HDTV 1080 and HDTV 720 There are two HDTV resolutions: 1080 and 720. The 1080 format runs 1920×1080, while the 720 format runs 1280×720. The 720 format utilizes progressive frames, as is indicated by the *p* in 720p. The 1080 format supports interlaced and progressive variations, as is indicated by the names 1080i and 1080p. Although the resolutions for ATSC HDTV and DVB HDTV are identical, the frame rates remain different. (See the next two sections for information on frame rates and interlacing.) HDTV formats are often written as *height-fields-frame rate*. For example, 720p24 is 1280×720 with 24 progressive frames-per-second.

1K, 2K, 3K, and 4K If a resolution ends with *K*, it refers to the number of pixels available horizontally. You can multiply the number by 1024 to get the result. For example 2K is 2048 while 4K is 4096. These resolutions are often employed by motion picture film scanners and recorders. As such, the number of vertical lines of resolution is dependent on the aperture used. An *aperture* is an opening in a plate that allows light to strike the film or the digital sensor. In order for a film scanner to capture the full motion picture frame, it must match its aperture to the one used by the film camera. Two common film formats, Academy and Full Aperture (also known as Super 35 or full-ap), use two different apertures, which leads to two different resolutions. Full Aperture uses the full width of the film to expose the frame (no room is left for the optical soundtrack). Full Aperture scans create a 2048×1556 2K image. Academy shrinks the exposure to make room for the optical soundtrack. Thus, the 2K Academy resolution is reduced to 1828×1332. Note that projectors employ apertures that have a slightly smaller opening than camera, scanner, and recorder apertures; thus, the edges of the image are cropped. Also note that HD digital video cameras operate at common *K* resolutions. For example, a 4096×2048 resolution is referred to as 4K 2:1.

Cinemascope and VistaVision Cinemascope is an anamorphic system that uses a special lens to squeeze an image horizontally so that it fits either the Academy or Full Aperture format. The projector uses a matching lens to restretch the image into its correct shape. A common Cinemascope scan size is 1828×1556. In this case, the compositing program must set the PAR to 2.0 to view the image in a nonstretched fashion. VistaVision (also known as 8-perf) rotates the film frame by 90° so that the frame has twice the film stock with which to work. A common VistaVision scan size is 3096×2048.

Common Frame Rates

There are three common frame rates: 24, 25, and 30.

The frame rate of motion picture film is 24. The 1080p and 720p ATSC HDTV formats, in addition to 480p EDTV, support 24 fps variations. Some digital video cameras

support 24p, which records progressive frames at 24 fps. Other cameras offer 24p Advanced, which records 24 fps by repeating frames with a 30 fps format.

The frame rate of PAL, SECAM, and DVB video and broadcast television is 25. The ATSC HDTV formats 1080p, 1080i, and 720p, as well as 480p EDTV, support a frame rate of 30. If the video is interlaced, 30 fps is sometimes expressed as 60, or 60 fields-per-second.

Tips & Tricks: NTSC and ATSC Frame Rates

When a frame rate is listed for an NTSC or ATSC SDTV, EDTV, or HDTV format, it is usually rounded off. Thus 30 fps is actually 29.97 fps and 24 fps is actually 23.98 fps. When whole-value frame rates are listed for PAL or DVB formats, the frame rate is accurate. Note that 29.97 is a simplification of the more accurate 30/1.001 and 23.98 is a simplification of 24/1.001.

Tips & Tricks: Frame Rate Conversions

Converting between frame rates has been a problem since the advent of television. Converting from 24 fps to 30 fps requires a *3:2 pulldown,* whereby frames must be duplicated. This leads to hesitation in the motion known as *judder.* Converting from 30 fps to 24 fps requires the removal or averaging of 6 frames per second. Converting between different international video and broadcast standards is equally difficult and often leads to some type of motion artifact. Thankfully, recent improvements in time warping and optical flow techniques allow compositors to change frame rates without unduly affecting the footage. For more information on time warping and optical flow, see Chapter 12, "Advanced Techniques."

Interlaced vs. Progressive

The process of interlacing breaks each frame of video into two fields. One field carries the even line numbers and a second field carries the odd lines numbers (see Figure 1.7). When interlaced footage is broadcast or played as video, the fields are displayed one at a time. Hence, NTSC SDTV displays 60/1.001 fields per second (often rounded to 59.94) and PAL SDTV displays 50 fields per second. Interlacing provides improved picture quality without requiring additional bandwidth. In contrast, progressive frames are not split apart but are displayed intact. CG renders, for example, are generally delivered to a compositor as progressive frames.

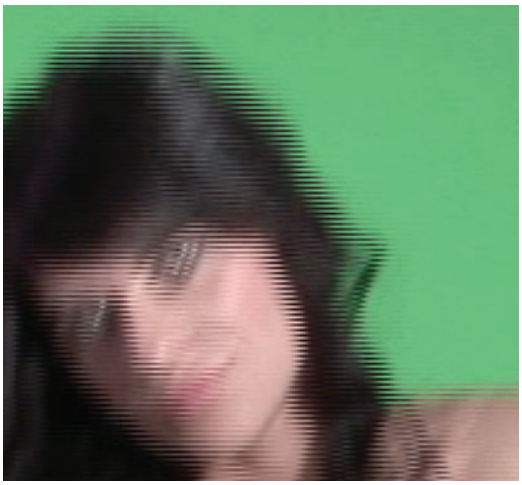


Figure 1.7 *Close-up of interlaced frame. The footage features a rapid camera zoom in. If the camera movement was slower, the interlacing would be less perceptible.*

Tips & Tricks: Progressive-Frame Tutorials

21 out of 22 tutorials included in this book use progressive-frame footage. Any footage that was shot interlaced has been converted to progressive frames. This was done to keep the tutorials relatively compact and to place the emphasis on various techniques, tools, effects, and nodes. In addition, this allows footage to be shared between After Effects and Nuke. At present, Nuke possesses a limited toolset for working with interlaced footage. Nevertheless, the ability of both programs to work with interlacing is discussed later in this chapter.

Setting Up a Composite

After Effects and Nuke each require a unique set of steps for creating a new project, importing footage, previewing composites, and rendering the result.

After Effects Projects

After Effects composites are referred to as *compositions*. Multiple compositions can exist in a single project. To create a new project, choose File → New → New Project. To adjust the project's global properties, choose File → Project Settings. In the Project Settings dialog box, you can choose the timeline measurement by switching between the Display Style radio buttons (Figure 1.8). If you are working exclusively with video footage, the default Timecode Base radio button is suitable. In this case, the timeline uses base 25 or base 30 measurements; that is, the time is counted in units of 25 frames for PAL and 30 frames for NTSC. If you are working with motion picture film or CG, it's generally best to select the Frames radio button, whereby the frames are counted upward from 1. (For the tutorials in this book, the Display Style is set to Frames.) The Project Settings dialog box also carries settings for bit depth and color space, which are discussed in Chapter 2, "Choosing a Color Space."

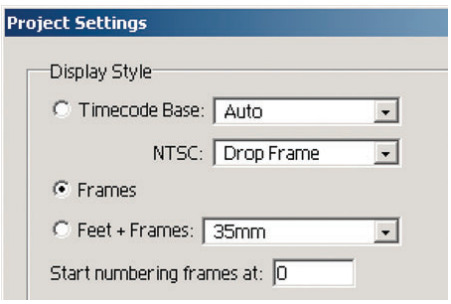


Figure 1.8 *The Display Style section of the Project Settings dialog box*

To create a new composition, choose Composition → New Composition. The Composition Settings dialog box opens, allowing you to set the composition's critical properties. The Preset menu sets common formats and their appropriate resolution, frame rate, and PAR (see Figure 1.9). You can also manually set the resolution Width and Height cells, plus enter a custom value into the Frame Rate cell. You can manually choose different PARs through the Pixel Aspect Ratio menu. The composition length is set by the Duration cell.

When a new composition is created, it's placed in the Project panel and named Comp *n* (see Figure 1.10). To see the composition as a tab in the Timeline panel, double-click the composition name. If you create more than one composition, each composition receives a separate tab in the Timeline panel. Initially, a composition is empty. However, you can create layers for the composition by importing and adding footage (see the next two sections).

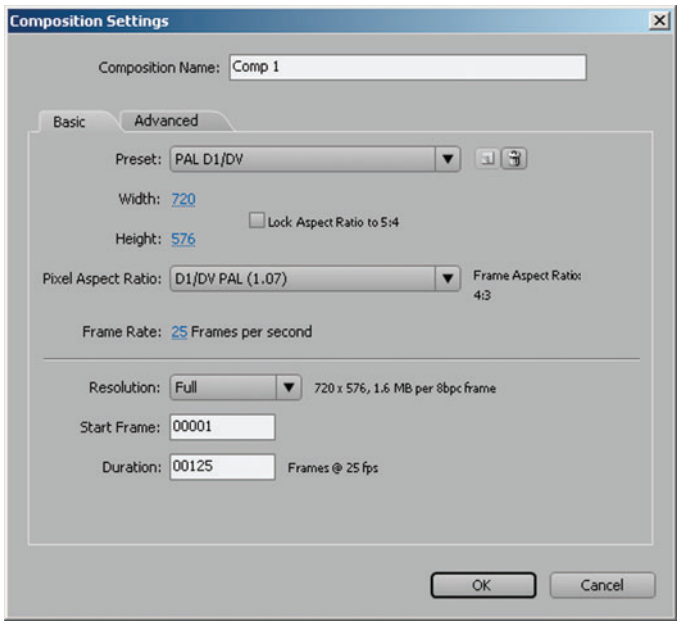


Figure 1.9 *The Composition Settings dialog box*

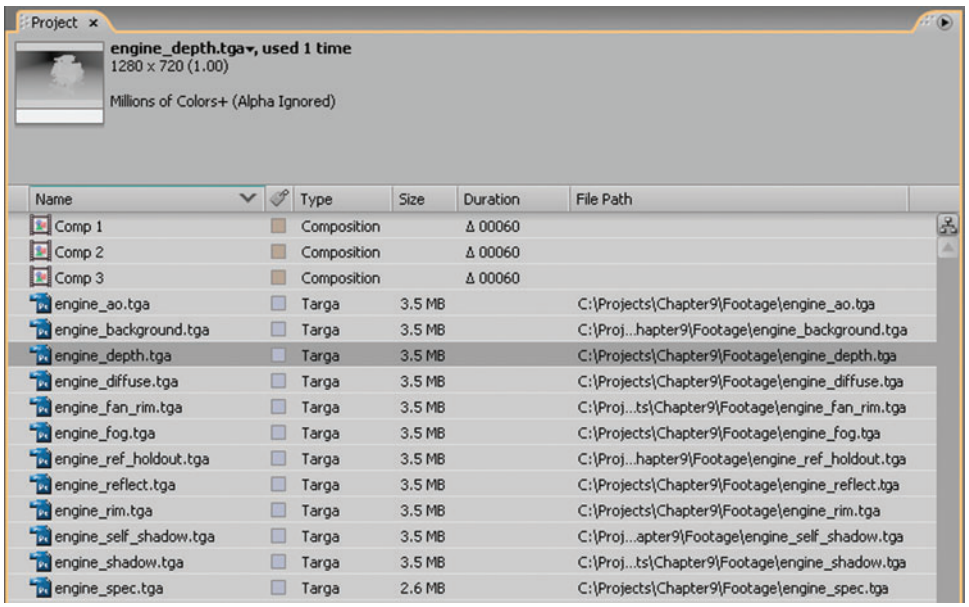

Project
engine_depth.tga, used 1 time
1280 x 720 (1.00)
Millions of Colors+ (Alpha Ignored)
Name
Type
Size
Duration
File Path
Comp 1 Composition Δ 00060
Comp 2 Composition Δ 00060
Comp 3 Composition Δ 00060
engine_ao.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_ao.tga
engine_background.tga Targa 3.5 MB C:\Proj...hapter9\Footage\engine_background.tga
engine_depth.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_depth.tga
engine_diffuse.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_diffuse.tga
engine_fan_rim.tga Targa 3.5 MB C:\Proj...ts\Chapter9\Footage\engine_fan_rim.tga
engine_fog.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_fog.tga
engine_ref_holdout.tga Targa 3.5 MB C:\Proj...hapter9\Footage\engine_ref_holdout.tga
engine_reflect.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_reflect.tga
engine_rim.tga Targa 3.5 MB C:\Projects\Chapter9\Footage\engine_rim.tga
engine_self_shadow.tga Targa 3.5 MB C:\Proj...apter9\Footage\engine_self_shadow.tga
engine_shadow.tga Targa 3.5 MB C:\Proj...ts\Chapter9\Footage\engine_shadow.tga
engine_spec.tga Targa 2.6 MB C:\Projects\Chapter9\Footage\engine_spec.tga

Figure 1.10 *The expanded Project panel with 3 compositions and 12 pieces of footage*

Importing Footage

To import an image, image sequence, QuickTime movie, or AVI movie into After Effects, choose File → Import → File. If you are importing an image sequence, select the first image of the sequence. By default, the program imports consecutively numbered frames

as a single unit. This assumes that the files follow the following naming convention: *name.#.extension*. *Extension* is the three-letter file format code, such as tga. The program also requires a consistent number of numeric placeholders within the sequence. For example, if a sequence has 200 frames, there must be three placeholders, as with *name.###.ext*. When footage is imported, it's placed in the Project panel.

By default, an imported image sequence or movie is assumed to be a particular frame rate, such as 30 fps. To change the frame rate interpretation, select the footage name in the Project panel, RMB+click, and choose Interpret → Main from the menu. In the Interpret Footage dialog box, change the Assume This Frame Rate value to a number of your choice and click OK.

Tips & Tricks: Missing Files and Assumed Frames Rates

If you open a project file and find that the footage is missing due to an incorrect file path, you can retrieve it by selecting the footage name in the Project panel, RMB+clicking, and choosing Replace Footage → File.

You can change the default frame rate interpretation for all imported footage by choosing Edit → Preferences → Import and changing the Frames Per Second cell.

Using the Layer Outline

To add imported footage to a composition as a layer, LMB+drag the footage name from the Project panel and drop it on top of the layer outline of a composition tab in the Timeline panel. (For a review of the After Effects interface, see the Introduction.)

The layer outline occupies the left side of the Timeline panel. Each composition receives its own tab and its own layer outline (see Figure 1.11). Once a layer exists in a layer outline, it can be selected with the Selection tool. If multiple layers exist in a composition, you can change their order by selecting a layer and LMB+dragging it up or down the layer stack.

Figure 1.11 *(Left) Three compositions, and the Render Queue, receive tabs in the Timeline panel. (Right) The Selection tool*

The layer outline functions in a similar fashion to the Layers panel within Photoshop. By default, higher layers occlude lower layers, except where the upper layers are transparent due to alpha channels. The way in which a layer is blended with the layer directly below it is controlled by a blending mode. Blending modes are set by RMB+clicking the upper layer name and choosing Blending Mode → *mode*. You can also set the blending mode by clicking the Toggle Switches/Modes button at the bottom left of the Timeline panel, which reveals Mode menu buttons beside each layer name in the layer outline.

The layer outline carries a number of additional composition switches, layer switches, and menus (see Figure 1.12).

Figure 1.12 *Layer outline of Timeline panel. The composition switches include (A) Open Parent, (B) Live Update, (C) Draft 3D, (D) Hide Shy Layers, (E) Frame Blending, (F) Motion Blur, (G) Brainstorm, and (H) Graph Editor. The layer switches include (I) Video, (J) Audio, (K) Solo, (L) Lock, (M) Shy, (N) Collapse Transformations, (O) Quality, (P) Effect, (Q) Frame Blending, (R) Motion Blur, (S) Adjustment Layer, and (T) 3D Layer.*

Composition switches affect all the layers of a composition while layer switches affect individual layers. Composition switches include the following:

Open Parent, when clicked, displays a menu that lists the nested location of the current composition. For example, if Comp 1 is nested inside Comp 3, the menu reads Comp 3, Layer *n*. If you select a menu item, the Timeline panel will jump to the composition tab where the nesting occurs.

Live Update, when toggled on, updates the composition in the viewer while its layers are transformed or otherwise manipulated. If Live Update is toggled off, manipulated layers are drawn as wireframe boxes.

Draft 3D, when toggled on, disables 3D lights, shadows, and camera depth of field. 3D setups are discussed in Chapter 11, "Working with 2.5D and 3D."

Hide Shy Layers, if toggled on, hides all Shy layers (see the list of layer switches later in this section).

Frame Blending, if toggled on, enables frame blending for all layers. This is necessary for time warping, which is described in Chapter 12, "Advanced Techniques."

Motion Blur, if toggled on, enables motion blur for all layers and is described in Chapter 6, "Convolution Filters."

Brainstorm, if clicked, creates multiple, temporary variations of the composition. To activate the Brainstorm dialog box, you must first select layer properties. The Brainstorm function randomly offsets the values of the selected properties to create the composite variations.

Graph Editor, if toggled on, reveals the Graph Editor in the Timeline panel. For information on the Graph Editor, see Chapter 5, "Transformations and Keyframing."

As for layer switches, the Frame Blend switch is discussed in Chapter 12, the Motion Blur switch is covered in Chapter 6, and the 3D Layer switch is detailed in Chapter 11. Additional layer switches follow:

Video toggles the layer's visibility. The layer remains in the layer outline, but it is not used for the composite.

Audio mutes any audio attached to the layer. (Since this book is concerned with digital compositing, the audio functionality of After Effects is not covered.)

Solo displays the layer for which the switch is activated but disables all other layers.

Lock, when toggle on, prevents alteration of the layer's properties or transformations.

Shy hides the layer if the Hide Shy Layers composition switch is toggled on. If a layer is hidden, it is no longer visible in the layer outline, but it continues to influence the composite.

Collapse Transformations, if toggled on, preserves image integrity for nested compositions. For example, the following may occur:

1. Layer A, which is carried by Comp A, is transformed.
2. Comp A is nested within Comp B.
3. Comp B is transformed.
4. As a result, layer A is essentially transformed two times. This double transformation can destroy pixels unless the transforms are collapsed and a net transformation is calculated at the start. This process is known as *concatenation*, which is discussed further in Chapter 5. (For more information on nesting, see the next section.)

Quality toggles between a draft and best-quality render. A backward slash indicates draft, while a forward slash indicates best quality.

Effect, if toggled off, disables any effects applied to the layer.

Adjustment Layer, when toggled on, converts the layer into an adjustment layer, which automatically applies any effects it carries to all layers below it. The RGB information of the layer itself is hidden.

By default, the layer outline is set to display switches. However, you can toggle to the menu view by clicking the Toggle Switches/Modes button at the bottom left of the Timeline panel. The menu view includes Mode menu buttons, which set each layer's blending mode, and Track Matte menu buttons, which convert the layer to a matte. The Track Matte functionality is discussed in Chapter 3, "Interpreting Alpha and Creating Mattes."

Nesting, Parenting, and Precomping Compositions

You can place one composition inside a second composition. This is called *nesting*. To do so, LMB+drag a composition from the Project panel and drop it on top of the layer outline of a different composition tab in the Timeline panel. When a composition is nested, the entire contents of the composition are represented by a single layer.

You can parent one layer to another by changing a layer's Parent menu (to the right of the layer switches). For example, you can parent an upper layer to a lower layer. When the lower layer is transformed, the upper layer inherits the same transformation. (Transformations are discussed at length in Chapter 5.)

As discussed earlier in this chapter, one disadvantage of the layer-based system is the difficulty with which the output of an adjusted layer or layers is sent to another composition. One workaround is to create a precomposite (also known as a precomp) through precomposing. To precompose one or more layers, follow these steps:

1. Select a layer or layers in a layer outline. Choose Layer → Pre-compose. In the Precompose dialog box, enter a name into the New Composition Name cell (see Figure 1.13). If a single layer is selected, you can select a radio button for Leave All Attributes In Comp or Move All Attributes Into The New Composition. If more than one layer is selected, only the Move All Attributes Into The New Composition radio button is available. Click the OK button.

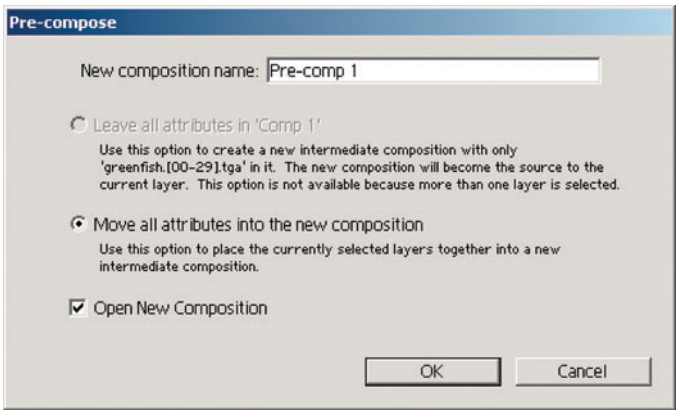

Pre-compose
New composition name: Pre-comp 1
Leave all attributes in 'Comp 1'
Use this option to create a new intermediate composition with only 'greenfish.[00-29].tga' in it. The new composition will become the source to the current layer. This option is not available because more than one layer is selected.
Move all attributes into the new composition
Use this option to place the currently selected layers together into a new intermediate composition.
Open New Composition
OK
Cancel

Figure 1.13 *The Pre-compose dialog box*

2. If a single layer is selected and Leave All Attributes In Comp is chosen, the selected layer is left at its original location. However, a duplicate of the layer is placed in a new composition with a name determined by the New Composition Name cell. If Move All Attributes Into The New Composition is selected, the selected layer or layers are moved to the new composition. The new composition is placed at the layers' original location.
3. You can nest, transform, or apply effects to the newly created layers within the new composition as you would any other composition.

You can manually create a precomp by rendering a composite through the Render Queue and importing the resulting footage. To isolate particular layers for a render, toggle off the Video layer switch for any layer that is unwanted.

Using Composition, Footage, and Layer Panels

There are four types of panels that appear in the central section of the After Effects interface: Composition, Footage, Layer, and Flowchart. To see a particular composition in the Composition panel, double-click the composition name in the Project panel. To view imported footage in the Footage panel, double-click the footage name in the Project panel. To view a layer, by itself, in the Layer panel, double-click the layer name in the layer outline of the Timeline panel. The Footage and Layer panel differs from the Composition panel in that they possess their own timelines. If the Composition panel is open and you switch between composition tabs in the Timeline panel, the active composition is automatically displayed. The Composition, Footage, and Layer panels each carry their own viewer. The viewer may show the default 2D view or carry multiple views of a 3D environment. (3D environments are described in Chapter 11; the Flowchart panel is discussed in the next section.)

Aside from carrying viewers, Composition, Footage, and Layer panels include a number of menus and controls (see Figure 1.14).

Figure 1.14 *Composition panel switches and menus: (A) Always Preview This View, (B) Magnification Ratio Popup, (C) Choose Grid And Guide Options, (D) Toggle Mask And Shape Path Visibility, (E) Current Time, (F) Take Snapshot, (G) Show Last Snapshot, (H) Show Channel, (I) Resolution/Down Sample Factor Popup, (J) Region Of Interest, (K) Toggle Transparency Grid, (L) 3D View Popup, (M) Select View Layout, (N) Toggle Pixel Aspect Ratio Correction, (O) Fast Previews, (P) Timeline, (Q) Comp Flowchart View, (R) Reset Exposure, (S) Adjust Exposure*

While the switches and menus will be described throughout the remaining chapters, a few are worth noting here:

Magnification Ratio Popup menu zooms in or out of the view. To scroll left/right or up/down in a viewer, LMB+drag with the Hand tool (to the right of the Selection tool).

Choose Grid And Guide Options menu allows you to apply Title/Action Safe, Grid, and Ruler overlays to the view.

Tips & Tricks: Title/Action Safe and Overscan

The Title/Action Safe overlay is designed for SDTV. It offers a quick way to make sure critical text and action doesn't get too close to the edge of frame. Due to the design limitations of CRT-based televisions, the frame edge is lost and is not seen by the viewer. This lost region is known as *overscan*. Although digital televisions offer greater control of the broadcast image display, overscan remains a feature. For example, HD televisions generally show the viewer the central 1776×1000 set of pixels out of a possible 1920×1080 pixels. If a project is intended for motion picture film, the Title/Action Safe overlay doesn't apply. Nevertheless, due to projector apertures and masks, a portion of the film frame is lost when shown in theaters. To compensate for this, some compositors import a custom field chart into the compositing program; a *field chart* indicates the area of exposure and projection for a particular camera setup.

Toggle Mask And Shape Path Visibility, if toggled off, hides mask and shape paths. Masks are discussed in Chapter 7, "Masking, Rotoscoping, and Motion Tracking."

Take Snapshot, when clicked, captures the current view and stores it in a cache. You can examine snapshots by clicking the Show Last Snapshot button. Snapshots are useful when comparing different frames or the results of different effect settings.

Resolution/Down Sample Factor Popup menu reduces the resolution of the composition to speed up the viewer update. If this is set to Full, the composite is set to 100% quality. If it's set to Half, half the pixels are discarded and a pixilated view is thus created.

Region Of Interest, if toggled on, allows you to LMB+drag interactively in the viewer to isolate a small area. This improves the update speed of the viewer.

Toggle Transparency Grid, if toggled on, changes the empty black background of the viewer to a white and gray checkerboard. This is useful for identifying subtle holes in a layer.

Toggle Pixel Aspect Ratio Correction, if toggled on, stretches non-square pixels into square pixels. For example, if a composition is set to DV resolution with a 0.9 PAR, Toggle Pixel Aspect Ratio Correction stretches the view horizontally to create a 1.0 PAR. Note that the new PAR only exists in the viewer and does not affect the composite when it's rendered through the Render Queue.

Fast Previews, if clicked, reveals a menu with the different display and graphics card options available on your machine.

The AE Flowchart

After Effects can display compositions and their relationships as a flowchart (node network). To display the flowchart, toggle on the Comp Flowchart View switch in the Composition panel or choose Composition → Comp Flowchart View. The flowchart is opened in a new Flowchart panel. You can display footage, solids, layers, and effects nodes by toggling on the display buttons at the bottom left of the Flowchart panel. Connection lines show the flow of information (see Figure 1.15). You can collapse a composition node and thus hide its inputs by clicking the + sign at the top of the node icon. Note that the flowchart is intended as reference. Connections cannot be changed within the flowchart view.

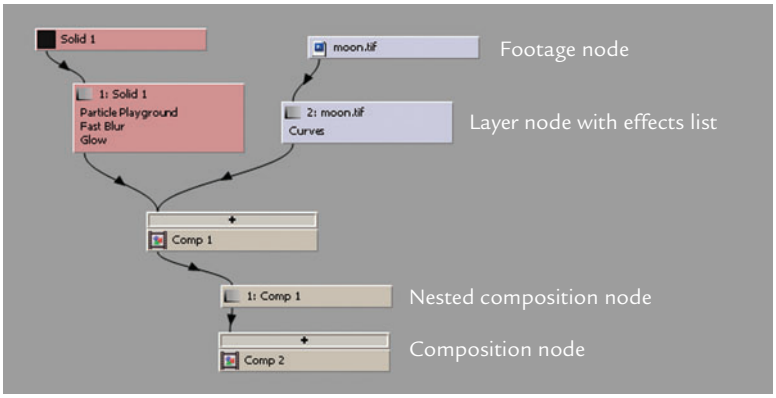


Figure 1.15 *Flowchart view in the Viewer panel*

Tips & Tricks: Composition Navigator

After Effects CS4 adds the Composition Navigator bar to the top of the Composition panel. The bar displays node network information for nested compositions. The bar includes the Composition Mini-Flowchart button. When clicked, the button displays the names of compositions immediately upstream and downstream of the active composition. (Upstream nodes provide information while downstream nodes accept information.)

Previewing a Composition

To play back the timeline, use the playback controls in the Time Controls panel. As the timeline is played, each frame is composited and stored in a cache. Once all the frames have been composited, the timeline is able to achieve real-time playback speeds. The playback speed is indicated by an Fps readout in the Info panel. The target frame rate is determined by the Frame Rate parameter of the Project Settings dialog box. However, you can change the rate through the Frame Rate menu of the Time Controls panel to achieve a different playback rate temporarily.

Rendering a Composition

To render out a composition, select the composition name in the Project panel and choose Composition → Add To Render Queue. A Render Queue tab is added to the Timeline panel (see Figure 1.16). Each queued item in the Render Queue is divided into four sections: Render Settings, Output Modules, Log, and Output To.

Render Settings controls the quality of the render. To adjust the quality, click the words *Best Settings*. In the Render Settings dialog box, you can adjust the Quality property (Best, Draft, or Wireframe), choose a custom frame range, and toggle on or off render features such as Motion Blur or Frame Blending (see Figure 1.17). By default, Quality is set to Best and the full frame range of the timeline is used. However, the Field Render and 3:2 Pulldown options are off by default (see the next section).

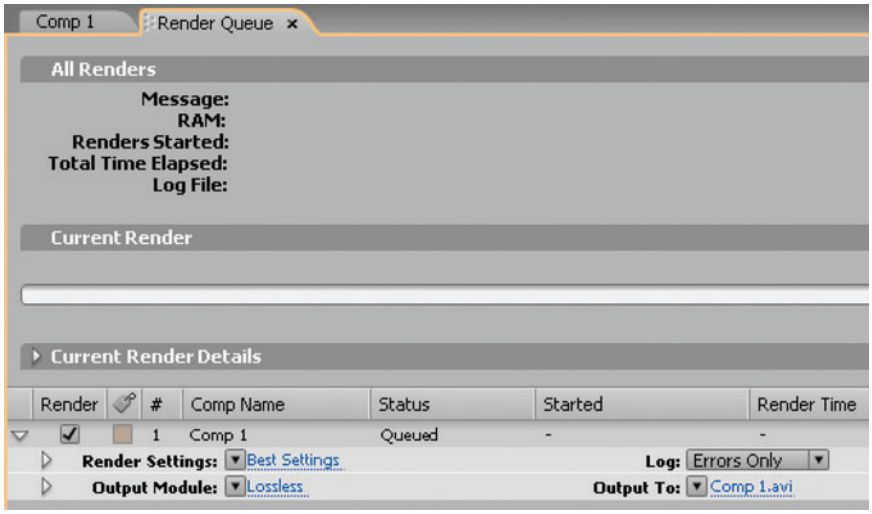


Figure 1.16 *The Render Queue tab with Comp 1 queued*

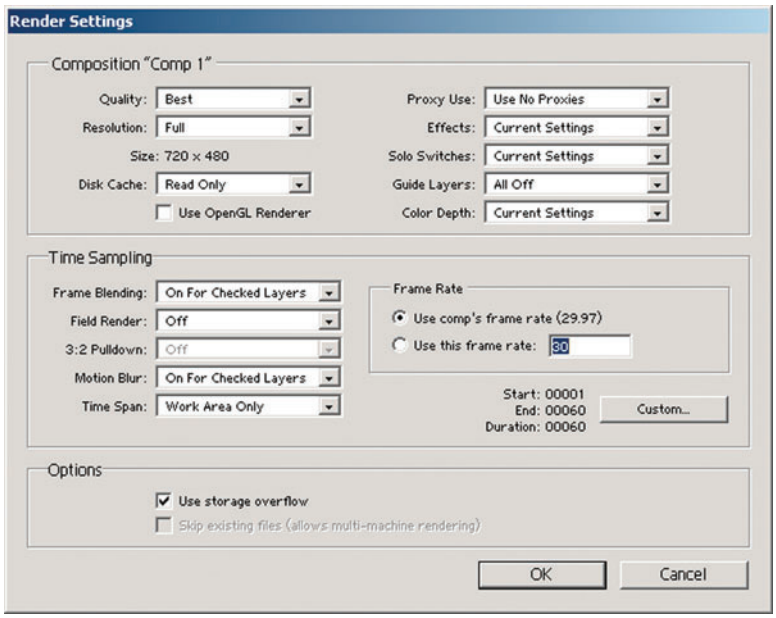


Figure 1.17 *The Render Settings dialog box*

The Output Module section sets the render format. To choose a different format, click the word *Lossless*. In the Output Module Settings dialog box, the Format menu lists all the formats supported by After Effects that are detected on the local machine (see Figure 1.18). QuickTime, AVI (Video For Windows), and Windows Media formats are suitable for tests, while image formats such as Targa and TIFF are superior for final renders. (For more information on image formats, see Chapter 2.) Once a specific format is selected, you can adjust the format compression and quality settings by clicking the Format Options button. The Channels menu determines which channels are rendered. For example, to render with an

alpha channel, change the menu to RGB+Alpha. You can also choose to render straight or premultiplied alpha through the Color menu. (For information on alpha and premultiplication, see Chapter 3). Finally, the Output Module Settings dialog box offers a means to rescale or crop an output through the Stretch and Crop check boxes. Note that the dialog box carries a Color Management tab, which allows you to render a composite to a specific color space. This process is discussed in Chapter 2.

The Log section sets the style of an error log text file that's written to disk. Output To sets the name and location of file(s) to be written. To select a name and location, click the current filename (for example, `Comp1.avi`). The Output Movie To dialog box opens. Enter the name into the file name cell using the format *`name`*`.[#].`*`extension`* for an image sequence and *`name`*`.`*`extension`* for QuickTime or AVI movies. For example, `test.[##].tga` is suitable for a Targa image sequence with 10 to 99 frames because it includes two numeric placeholders.

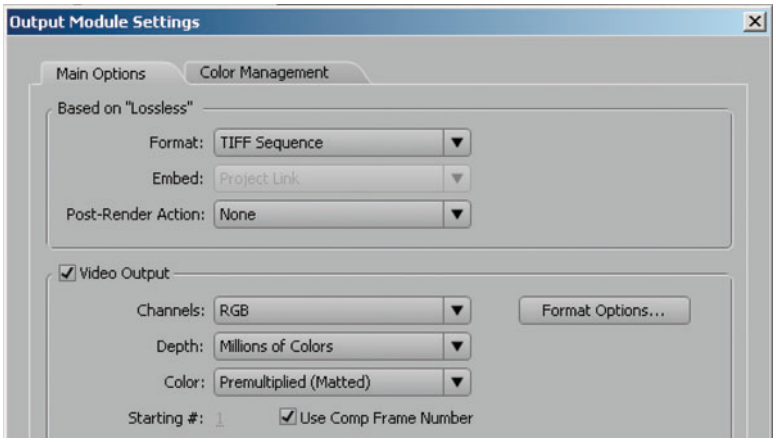


Figure 1.18 *The top of the Output Module Settings dialog box*

Once the various render settings are selected, you can launch the render by clicking the Render button at the top right of the Render Queue tab. When the render finishes, the queued item remains listed. If you queue an additional composition, it's added to the queue list. You can delete an old queue by selecting the item name in the list and pressing the Delete key.

Interlacing in AE

If you import interlaced video footage, the interlacing is recognized and is indicated by the footage statistics provided at the top of the Project panel. The word *separating* is included with an indication of which field is dominant (upper or lower, see Figure 1.19). An upper field contains the odd lines of a frame, while the lower field contains the even lines of a frame. Different video formats carry different field dominances, which affect the way edits are made and how de-interlacing is carried out. When After Effects identifies interlacing, it separates the fields and converts them to individual frames. In essence, this doubles the frame rate. If you open the footage in the Footage panel, you can examine each separated field by stepping through the Footage panel timeline with the Page Down and Page Up keys. For example, if the footage has lower dominance and the timeline is at frame 1, the lower field of frame 1 is displayed. Pressing the Page Down key once displays the upper field of frame 1. Pressing the Page Down key a second time displays the lower field of frame 2. The frame number is indicated by the Footage panel's Current Time button.

If footage is field-separated and dropped into a composition, only the dominant field of each frame is displayed by the Composition panel as you play the timeline (see Figure 1.20). Both fields continue to exist and are used if the composition is rendered with interlacing. You can force interlacing on the render by changing the Field Render menu in the Render Settings dialog

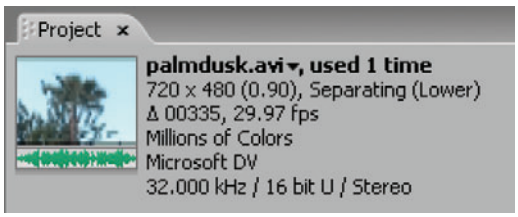

Project
palmdusk.avi, used 1 time
720 x 480 (0.90), Separating (Lower)
Δ 00335, 29.97 fps
Millions of Colors
Microsoft DV
32.000 kHz / 16 bit U / Stereo

Figure 1.19 *Interlaced footage identified by the word* Separating *in the Project panel*

box to Upper Field First or Lower Field First (the field dominance should match the intended output format). During the render, the program creates the appropriate interlacing. Note that the interlacing will be successful only if QuickTime Movie, AVI (Video For Windows), or Windows Media is selected as the output format; if you choose to render an image sequence, the fields are combined without averaging or interpolation. On the other hand, if a field-separated composition is not rendered with interlacing, half the information for each frame is discarded and the final image quality may suffer (particularly if you're using low resolution footage for the project). You can mix and match field-separated and progressive-frame footage in a composition with no penalty, although you should take care when you set up a render through the Render Queue (the render will convert field-separated footage into progressive frames or the render will convert progressive frames into interlaced fields).

Figure 1.20 *(Left) Close-up of model lifting a water bottle. The dominant upper field, as seen in the viewer of the Footage panel, is displayed. (Center) Lower field of same frame. Note the significantly higher position of the bottle and index finger. (Right) Upper field of the same frame, as seen in the viewer of the Composition panel.*

If you are working with D1 or DV footage, it's generally best to leave the field dominance interpretation to the program. However, you can choose a different field dominance or select a field dominance for a different video format through the Interpret Footage dialog box. To access this, select the footage name in the Project panel, RMB+click, and choose Interpret → Main from the menu. You can set the Separate Fields menu to Off, Upper Field First, or Lower Field First. If field dominance is chosen incorrectly for a piece of footage, objects will appear to move erratically in the viewer of the Footage panel. If the footage possesses a field dominance but the Field Separation is set to Off, the fields are combined without averaging and heavy artifacts appear around objects in motion.

Various interlacing/de-interlacing plug-ins, such as RE:Vision Effects Twixtor, are available for After Effects and are generally superior to the program's native tools when handling interlacing tasks.

3:2 Pulldown in AE

As mentioned earlier in this chapter, a 3:2 pulldown is required when converting between 24 fps and 29.97 or 30 fps. If you drop 24 fps footage into a 29.97 fps composition, After Effects automatically applies the pulldown by repeating frames of the 24 fps footage. To remove the resulting hesitation in the movement, you can apply time warping and frame blending (which is detailed in Chapter 12). If you drop 30 fps footage into a 24 fps composition, frames are removed from the 30 fps footage. To remove resulting skipping within the movement, you can apply time warping and frame blending.

In addition, After Effects provides a means to remove a 3:2 pulldown that was *previously* applied to footage. For example, if motion picture footage was transferred to video

and that interlaced video is imported into After Effects, you can remove the 3:2 pulldown and thus return the motion picture footage to 23.976 fps, which is close to its original 24 fps. This process is commonly referred to as *inverse telecine*. To apply inverse telecine, open the Interpret Footage dialog box, set the Separate Fields menu to the appropriate field dominance, and click the Guess 3:2 Pulldown button (see Figure 1.21). The program identifies the style of pulldown and removes the duplicated frames. (Different pulldown styles repeat the original film frames in different patterns.)

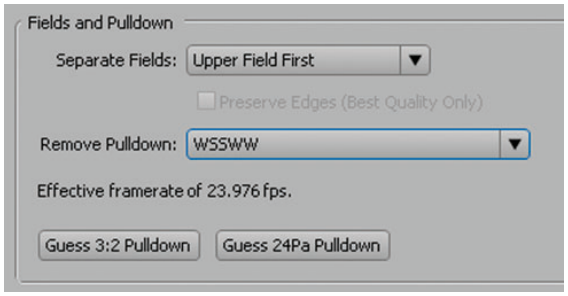


Figure 1.21 *The Fields And Pulldown section of the Interpret Footage dialog box. The WSSWW listed by the Remove Pulldown menu is the identified pulldown style, where* W *indicates a whole frame and* S *indicates a split frame. Split frames are composed of two neighboring whole frames.*

Tips & Tricks: 24Pa Pulldown

After Effects includes a Guess 24Pa Pulldown button in the Interpret Footage dialog box. This is designed to remove the pulldown created by 24p Advanced video systems, which record 24 progressive fps within a 30 fps interlaced video format.

Nuke Scripts

Nuke composites are called *scripts*. To create a new script, choose File → New from the main menu bar. (For a review of Nuke panes and menus, see the introduction.) To edit the script's global properties, choose Edit → Project Settings. In the properties panel, the Frame Range parameter determines the duration, the Fps parameter sets the frame rate, and the Full Size Format parameter establishes the composite resolution. (A Nuke parameter is any property with a slider, numeric cell, or check box.)

Importing Files

To import footage into a Nuke script, create a Read node. To do so, RMB+click in the Node Graph and choose Image→ Read from the menu. (Throughout this book, the RMB+click technique is used almost exclusively when creating new nodes.) You can also LMB+click the Image button at the top of the left toolbar and choose Read from the menu. Once the Read1 node exists, its properties panel opens in the Properties pane. If the properties panel is not visible, double-click the Read1 node in the Node Graph. You can browse for the footage by clicking the File browse button (see Figure 1.22). Nuke automatically recognizes image sequences and represents them with the following syntax: `name.padding.extension`. `Padding` indicates the number of numeric placeholders used for the sequence numbering. This is encoded as `%01d`, `%02d`, `%03d`, and so on. `%02d`, for example, signifies that there are two placeholders, which creates `01`, `02`, `03`, and so forth. `Extension` is the three-letter file format code, such as `tga`.

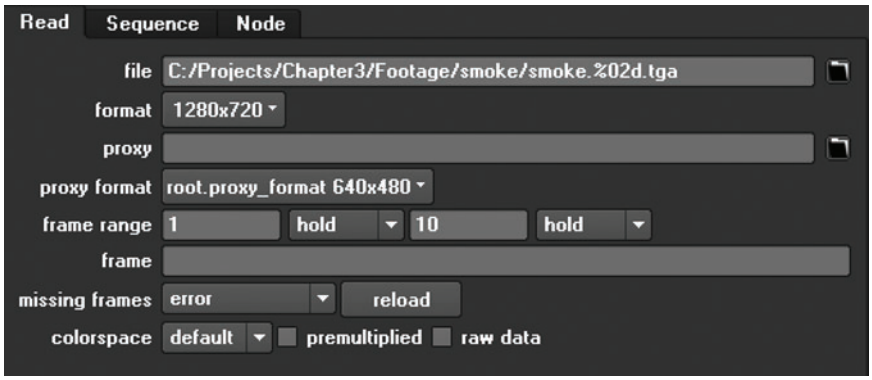


Figure 1.22 *A Read node's properties panel*

Within the Read node's properties panel, you can set the color space and alpha premultiplication of the imported files. These parameters are discussed in Chapter 2 and Chapter 3.

If the resolution of imported footage does not match the Full Size Format setting in the Project Settings properties panel, the footage will not "fit" the project resolution frame. Thus it may be necessary to connect a Reformat node. For a demonstration of this, see the section "Nuke Tutorial 1: Working with the Reformat Node" at the end of this chapter.

Connecting Nodes

You can connect nodes in an almost endless fashion in the Node Graph. Here are a few approaches to keep in mind:

- To connect two nodes, LMB+drag an unused pipe (connecting line) from one node and drop it on a second node. Each pipe has a specific input or output function. Input pipes are indicated by a line and arrowhead pointing toward the node (see Figure 1.23). Input nodes are generally labeled. The exception to this rule is a Mask input, which takes the form of an inward-pointing arrow stub at the right side of the node. Output pipes are indicated by an outward-pointing arrow stub at the bottom edge of the node.
- If a node is selected and a new node is created, the new node is automatically connected to the selected node's output.
- To disconnect a node, LMB+drag the pipe away from the connected node. When you release the mouse button, the pipe is broken. You can also select the node that is downstream (that is, the one that receives the input) and press Ctrl+D.
- To select a node, LMB+click the node icon. To open a node's properties panel, double-click the node icon. To select multiple nodes, Shift+click the node icons.
- To disable a node so that it no longer influences the node network, select the node and press D. To enable the node, press D again.
- To delete a node, select the node icon and press the Delete key.
- To rename a node, open its properties panel and enter a new name into the top cell.

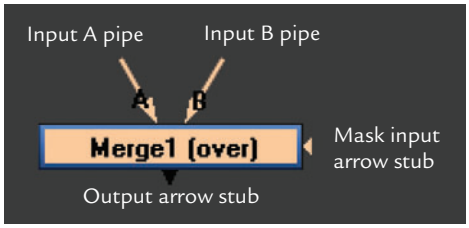


Figure 1.23 *Pipes and arrow stubs of a node*

- To duplicate a node with its current setting, select the node and choose Edit → Duplicate from the menu bar.
- You can clone a node by selecting the node and choosing Edit → Clone from the menu bar. Cloning differs from duplication in that the cloned node maintains an active link to the original node (see Figure 1.24). Thus, if the properties of the original node are updated, the updated information is passed to the cloned node. You can sever the link between the clone and the original by choosing the cloned node and selecting Edit → Declone.

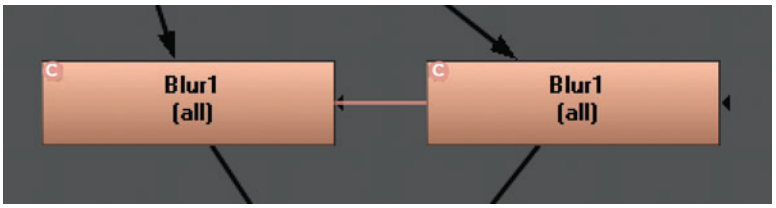


Figure 1.24 *A cloned node (left) is automatically connected to the source node (right), as indicated by the orange pipe and the orange C symbol at the top-left corner of each node icon.*

- To help organize the node network, you can force bends into pipes. To do so, choose the node that is upstream (that is, provides the output), RMB+click and choose Other → Dot. A dot icon is inserted into the pipe (see Figure 1.25). You can LMB+drag the dot and thus force a right angle into the connection. The dot carries no parameters. You can also insert a dot by pressing the Ctrl key while the mouse is in the Node Graph. A diamond appears at the midpoint of every pipe. Continue to hold the Ctrl key while LMB+dragging a diamond. The diamond is instantly converted to a dot.
- To zoom in or out of the Node Graph, Alt+MMB+drag. To pan, Alt+LMB+drag. To frame the node network automatically, MMB+click while the mouse pointer is over the Node Graph.

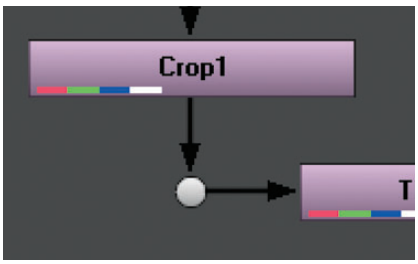


Figure 1.25 *A dot creates a bend in a pipe.*

Using the Viewer Pane and Viewers

To view a composite, you must connect a viewer to the node network. By default, a Viewer 1 node is provided. To connect Viewer 1, LMB+drag the 1 pipe and drop it on top of the node you wish to view. Once a viewer is connected, its output is displayed in the Viewer pane. You can also connect a viewer by selecting the node you wish to view and pressing the 1 key. You can connect more than one node to a viewer (see Figure 1.26). To do so, select the nodes one at a time and press the next available viewer number on the keyboard, such as 2, 3, or 4. To have each connection's output appear in the Viewer pane, press the appropriate number key.

You can create additional viewers and connect each viewer to a different node. To do so, choose Viewer → Create New Viewer from the menu bar. If more than one viewer exists in a script, each viewer receives a tab in the Viewer pane.

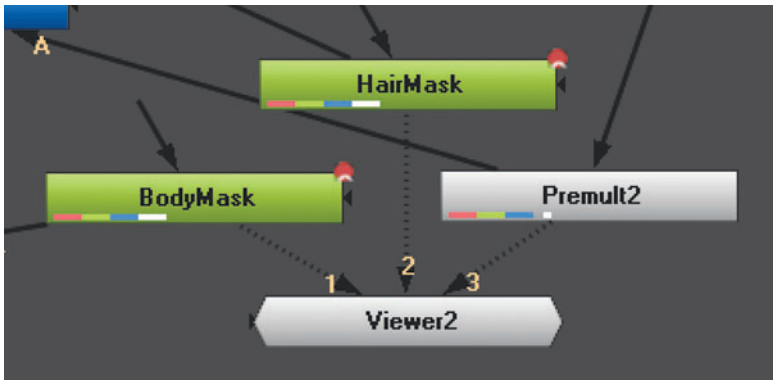


Figure 1.26 *One viewer connected to three nodes*

Aside from displaying the outputs of various viewers, the Viewer pane carries a number of menus and controls (see Figure 1.27). These include the ability to control the timeline; display different channels; adjust the viewer f-stop, gain, and gamma; pick a particular display LUT; and switch between 2D and 3D camera views.

Figure 1.27 *Top of the Viewer pane: (A) Channels, (B) Channel In Alpha, (C) Display Style, (D) Wipe controls, (E) Zoom, (F) View Selection, (G) 3D View Lock, (H) Default Camera/Light, (I) Gain via stops, (J) Gain via slider, (K) Gamma Toggle, (L) Gamma via slider, (M) Toggle Proxy Mode, (N) Downrez, (O) Region-Of-Interest, (P) Update, (Q) Pause, (R) Display_LUT, (S) Input_process, (T) Cliptest*

While most of the Viewer pane menus and controls will be described throughout the remaining chapters, a few are worth noting here:

Channels determines which channels are available for view in the viewer. To cycle through the chosen channels, press the R, G, and B keys while the mouse hovers over the Viewer pane. You can also step through the channels by changing the Display Style menu.

Channel In Alpha allows you to select a different channel to display where the alpha channel would be normally. For example, you can change the menu to Rgb.red and press the A key while the mouse hovers over the Viewer pane to view the red channel. If the menu is set to None, pressing A will display the alpha channel.

Zoom controls its namesake. You can interactively zoom in the Viewer pane by Alt+MMB+dragging. You can scroll in the Viewer pane by Alt+LMB+dragging. Pressing the MMB will maximize the view frame automatically without cropping the edges.

Downrez displays a simplified version of the viewer output. If Downrez is set to 1, the viewer displays the output at 100% quality. If it's set to a value other than 1, pixels are

averaged to speed up the viewer update. For example, if the Downrez menu is set to 16, the project's horizontal and vertical resolution is reduced to 1/16th.

Toggle Proxy allows you to switch to a low-resolution version of the composite. For this to work, the Proxy check box in the Project Settings properties panel must be selected. The degree to which the image is reduced is based upon the Proxy Mode menu, which can be set to Format or Scale. If the menu is set to Scale, the proxy works like the Downrez menu, whereby pixels are averaged together. If the Proxy Mode menu is set to Format, the proxy resolution is based on the Proxy Format menu.

Tips & Tricks: Proxy Resolutions

The Read node supports the importation of a full-resolution and a proxy-resolution version of the same piece of footage. The full-resolution version is loaded through the File parameter, while the proxy-resolution version is loaded through the Proxy parameter. If the Toggle Proxy button is toggled on in the Viewer pane, the proxy footage is used.

Wipe displays the output of two nodes simultaneously within the same viewer frame (see Figure 1.28). To activate the wipe, you must connect two nodes to the active viewer. Once the nodes are connected, select each node name from the A and B drop-down menus in the Viewer pane. Change the Combine A And B menu to Wipe. A wipe handle appears in the viewer. You can interactively LMB+drag the handle left or right to change the screen split between the two outputs. You can adjust the opacity of node B by LMB+dragging the handle's diagional arm.

Figure 1.28 *Two outputs are split by a wipe handle*

Region-Of-Interest, when toggled on, creates a region box in the viewer. Updates occur only within the region box. You can alter the size of the box by LMB+dragging the box edges. To reposition the box, LMB+drag the center crosshair.

Pause, when toggled on, prevents the viewer from updating, even when the node network is updated or parameter values are changed.

Update, when clicked, forces an update, even if the Pause button is toggled on.

Cliptest, when toggled on, applies zebra stripes to any part of the output that exceeds an RGB value of 1, 1, 1.

Playing the Timeline and Creating a Flipbook

There are two ways to test a composite over time within Nuke: play back the timeline or create a Flipbook.

To play back the timeline, use the time controls in the Viewer pane. As the timeline is played, each frame is composited and stored in cache. Once all the frames are composited, the timeline is able to achieve real-time playback speeds. The playback speed is indicated by the Desired Playback Rate cell, which is to the immediate right of the playback controls. The target frame rate is determined by the Fps parameter of the Project Settings properties panel. However, you can change the value in the Desired Playback Rate cell to temporarily achieve a different playback rate.

To create a Flipbook, select the node whose output you wish to see and choose Render → Flipbook Selected from the menu bar. In the Frames To Flipbook dialog box, enter a frame range. Each frame of the composite is written to a disk cache as an RGB file (with an `.rgb` extension). Once the render is complete, the IRIDAS FrameCycler window opens. FrameCycler is an external program and thus has its own unique interface (see Figure 1.29).

Figure 1.29 *FrameCycler window*

To center the rendered movie in the FrameCycler viewer, press Ctrl+Home. To scroll within the viewer, Ctrl+MMB+drag. To zoom in or out, set the Zoom menu (directly above the time controls). To see the render at full size, set the Zoom menu to Resample Off. You can interactively scrub the timeline by RMB+dragging left or right in the viewer or LMB+dragging the playhead bar on the timeline. The time controls function as they do in any standard player. The first time you play the timeline, the rendered frames are reloaded into memory. You can save a flipbook movie as an image sequence, QuickTime, or AVI by clicking the Render tab, choosing an output tab in the Render dialog box, and clicking the Render button. You can load previously rendered sequences or movies by pressing the Desktop tab and browsing for files. To add a file to the timeline, press the + sign that appears over the file icon. Multiple movies and image sequences can exist on the timeline simultaneously.

Additional Resources: FrameCycler Documentation

FrameCycler is a robust player that includes support for basic editing, color grading, 3D LUTs, version management, network file sharing, command-line control, and stereoscopic vision. For documentation on the extensive interface and built-in toolsets, see the HTML Documentation Index in the `FrameCyclerWindows/doc/` folder located within the Nuke program directory.

Writing an Image Sequence

To render a composite to disk, create a Write node. To do so, select the node whose output you wish to render, RMB+click in the Node Graph, and choose Image → Write. Browse for a location by clicking the browse button beside the File parameter in the Write node's properties panel (see Figure 1.30). Add the filename to the path cell using the format *`name.#.extension`*. For example, enter `C:/render/test.###.tga` if you are rendering between 100 and 999 frames. Click the Save button. The program automatically recognizes the filename extension and sets the File Type menu for you. Each File Type setting adds a unique set of quality menus to the bottom of the properties panel. For example, TIFF adds a Data Type (bit depth) and a Compression menu. Once you've set the quality menus, click the Render button. In the Frames To Render dialog box, enter the desired frame range. For instance, if you want to render frame 10, enter 10. If you want to render frames 5 to 20, enter 5,20.

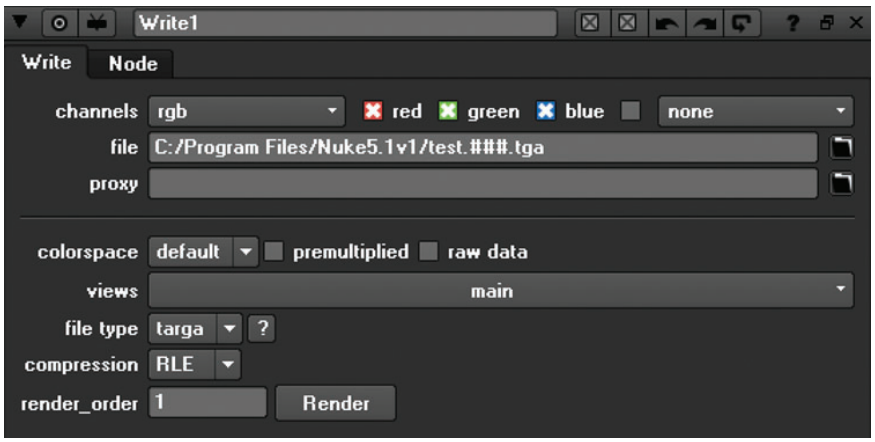


Figure 1.30 Write node properties panel

Interlacing and 3:2 Pulldown in Nuke

Nuke 5.1 carries a hidden DeInterlace node. To access the node, press the X key to bring up the Command Line window. With the Script radio buttons set to TCL, enter **DeInterlace** in the cell and click OK (note the capitalization). A DeInterlace node is added to the Node Graph. Connect the DeInterlace node to the output of a Read node that carries interlaced footage. The interlacing is removed. However, since the DeInterlace node carries no adjustable parameters, the output may be scaled vertically. To correct this, connect Transform and Reformat nodes to scale and fit the output back to the project resolution. For example, in Figure 1.31, interlaced HDTV footage is imported. The DeInterlace node removes the interlacing but stretches the footage vertically by 125%. A Transform node is added with its Scale property set to 1,0.75. A Reformat node is included so that the result of the Transform node is snapped back to the correct 1280×720 bounding box size.

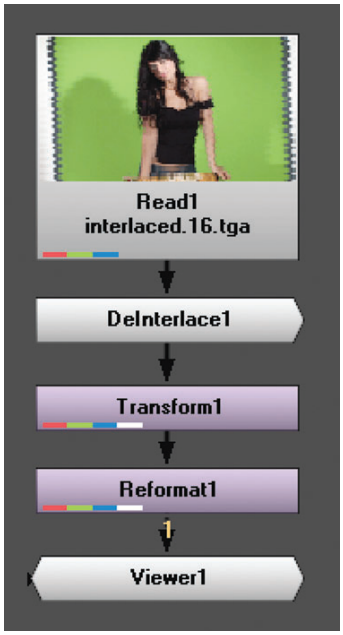


Figure 1.31 *A DeInterlace node removes interlacing with the help of a Transform and Reformat node. A sample Nuke script is included as* `deinterlace.nk` *in the Tutorials folder on the DVD.*

In addition, Nuke 5.1 includes two gizmo nodes for working with pulldowns: Add 3:2 Pulldown and Remove 3:2 Pulldown. Both are found in the Time menu. Each carries a Phase parameter, which you can use to offset the fields incrementally. Various interlacing/deinterlacing plugins and gizmos are available for Nuke. For example, the FieldsKit gizmo is available at `www.creativecrash.com`.

Tips & Tricks: Nuke Primitives

Nuke provides a number of primitives that are useful for testing networks or seeing the results of particular filters. You can add a primitive to the Node Graph by RMB+clicking and choosing either Image → *node* or Draw → *node*. The Image menu carries the Constant (solid color), Checkerboard, and Colorbars (NTSC test pattern) nodes. The Draw node includes the Radial (solid circle), Ramp (gradient), and Rectangle nodes.

AE and Nuke Tutorials

In this chapter's tutorials, you'll create new projects and scripts. In After Effects, you'll work with interlaced footage and in Nuke you'll work with footage that has different resolutions.

AE Tutorial 1: Working with Interlaced Footage

Working with interlaced video footage presents its own unique set of challenges.

1. Open After Effects. Choose File → New → New Project. Choose File → Project Settings. In the Project Settings dialog box, select the Frames radio button in the Display Style section. This consecutively numbers frames on the timeline. Note that the Project Settings dialog box includes Depth (bit-depth) and Working Space (color

space) menus. It's important to set these menus at the start of each project. Chapter 2 discusses bit depths and color space in great detail. For this tutorial, Depth may be left at 8 Bits Per Channel and Working Space may be left set to None. Click the OK button.

2. Choose Composition → New Composition. In the Composition Settings dialog box, change the Preset menu to HDV/HDTV 720 29.97. This sets the width to 1280, the height to 720, and the frame rate to 29.97. Change the Duration cell to 60, and click the OK button. Comp 1 is added to the Project panel.
3. Choose File → Import → File. In the Import File dialog box, browse for `interlaced.mov` in the Footage folder on the DVD. `interlaced.mov` is added to the Project panel. LMB+drag the QuickTime from the Project panel to the outline layer of the Comp 1 tab in the Timeline panel.
4. Play back the timeline. The motion of the camera zoom appears smooth. In reality, After Effects has incorrectly interpreted the field dominance as upper. This is not visible in the viewer of the Composition panel. This is due to the program displaying only one field per frame when playing back the timeline for the composition. To see all the fields, double-click the footage name. This opens the footage in the Footage panel. To step through the fields one at a time, press the Page Down and Page Up buttons. Page Down moves forward, starting with the dominant field for each frame. Page Up moves backward. Note that the fields appear out of order. Play back the footage using the Footage panel's time controls. The motion appears erratic.
5. To solve the field problem, select the `interlaced.mov` footage in the Project panel, RMB+click, and choose Interpret Footage → Main. In the Interpret Footage dialog box, change Separate Fields to Lower Frame First and click OK. Play the footage using the Footage panel's time controls. The motion is now smooth (that is, the fields are no longer out of order).
6. To convert the field-separated footage into progressive-frame footage, you can render out an image sequence. To do so, select Comp 1 in the Project panel and choose Composition → Add To Render Queue. A Render Queue tab is added to the Timeline panel with Comp 1 listed as the first queue. Click the word *Lossless*. In the Output Module Settings dialog box, change the Format menu to Targa Sequence. Click the OK button. In the Render Queue tab, note the phrase `Comp 1_[##].tga` next to Output To. This is the default name given to the soon-to-be-rendered frames. To change to a different render directory, click the phrase `Comp 1_[##].tga`. In the Output Movie To dialog box, browse for a directory. You can also type in a new render name in the File Name cell. The `[##].` portion of the name is critical for proper frame numbering. Two pound signs indicate two numeric placeholders, which is suitable for a timeline duration that runs between 10 and 99 frames. Click the Save button to close the Output Movie To dialog box. Click the Render button.
7. To examine the rendered footage, import it into the project. Choose File → Import → File. In the Import File dialog box, browse for the rendered footage. Because it's an image sequence, you need only select the first frame of the sequence. The program automatically imports the entire sequence as a single unit. Double-click the new footage's name in the Project panel to open it in the Footage panel. Step through the footage one frame at a time to examine the quality. Since the footage was rendered without interlacing, there are no fields. Note how the footage progresses in coarser steps. Every other field was lost during the render. Nevertheless, the footage is fairly high resolution, so it still creates smooth motion. The tutorial is complete. A sample After Effects project is included as `ae1.aep` in the Tutorials folder on the DVD.

Nuke Tutorial 1: Working with the Reformat Node

Working with source footage that possesses different resolutions can lead to formatting and composition problems unless special steps are taken.

1. Open Nuke. Choose Edit → Project Settings from the menu bar. In the Project Settings property panel, set the Full Size Format menu to 1K_Super_35(full-ap). This creates a project with a resolution of 1024×778. Note that the resolution bears no indication of a PAR. In contrast, the NTSC format displays a size of 720×486 .9, where the .9 is the non-square PAR. If a PAR is not listed, it's assumed to be 1.0.
2. In the Node Graph, RMB+click and choose Image → Read. In the Read1 node's properties panel, browse for `symbols.tga` in the Footage folder on the DVD. Select the Premultiplied check box to interpret the alpha channel correctly. Connect a viewer to the Read1 node. A graphic with five symbols is shown. The viewer indicates the size of the graphic by adding a 1024,778 notation to the top-right corner of the view frame. In this case, the graphic is the same size as the project resolution (see Figure 1.32). The project resolution is indicated at the lower-right corner of the frame.

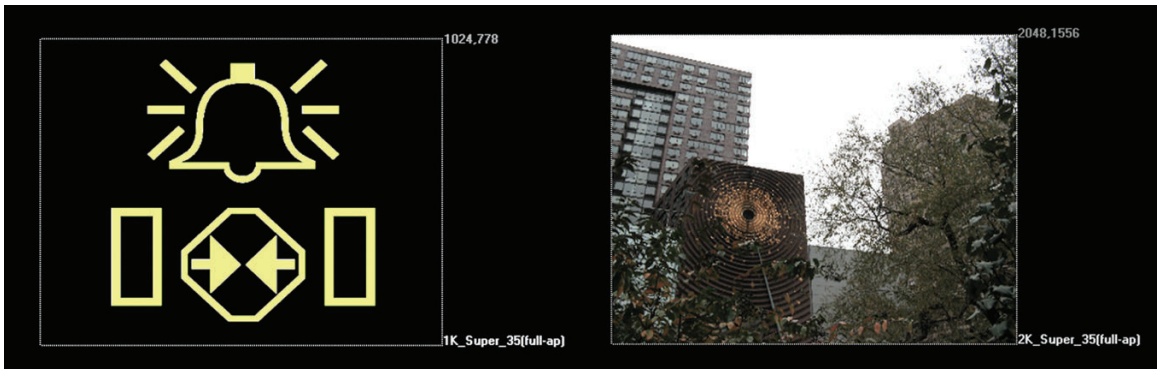


Figure 1.32 *(Left) 1024×778 symbols graphic (Right) 2048×1556 city photo*

3. In the Node Graph, RMB+click and choose Image → Read. In the Read2 node's properties panel, browse for `square.tif` in the Footage folder on the DVD. Connect the viewer to Read2. A city square is displayed. However, the view adapts to the new, larger resolution of the `square.tif` image. This is indicated by the 2048,1556 notation at the top-right of the view frame (see Figure 1.32).
4. With no nodes selected, RMB+click and choose Merge → Merge. Connect the viewer to the Merge1 node. Connect input B of the Merge1 node to the output of the Read2 node. Connect input A of Merge1 to the output of Read1. The Merge1 node applies a blending operation to combine the two images. Because `symbols.tga` carries an alpha channel, it appears on top of the city square. However, since `square.tif` is larger than `symbols.tga` and the project resolution, the view frame remains fixed at 2048×1556. In addition, the symbols graphic is forced to the bottom left of the frame (see Figure 1.33). If you were to render the Merge1 node's output, the resolution would remain 2048×1556.
5. To force the Merge1 node to create a project-sized resolution, feed the Read2 node through a Reformat node. To do so, select the Read2 node, RMB+click, and choose Transform → Reformat. A Reformat1 node is inserted after Read2. The composition instantly returns to the proper size of 1024×778, and the symbols take up the entire

frame. The Reformat node forces the Read2 output to conform to the output format established by the project settings. For additional information on the Reformat node, see Chapter 5. The tutorial is complete (see Figure 1.34). A sample Nuke script is included as `nuke1.nk` in the Tutorials folder on the DVD.

Figure 1.33 *The initial composite. The ouput size is forced to 2048×1556.*

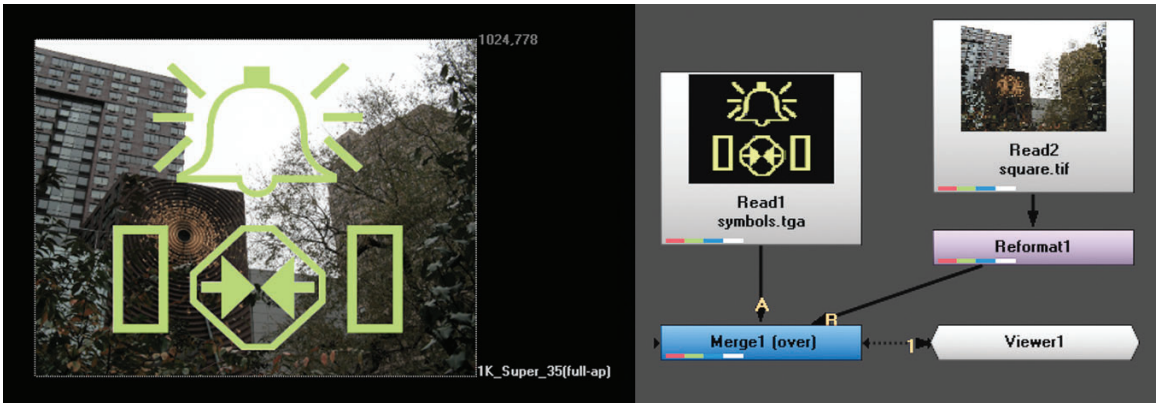


Figure 1.34 *(Left) The final composite with the proper size of 1024×778 (Right) The final node network*

Tips & Tricks: The Crop Node

The Crop node (in the Transform menu) allows you to reduce the resolution of an output by cropping the image edges. The Box X, Y, R, and T cells define the left crop edge, bottom crop edge, right drop edge, and top crop edge respectively. If the Reformat check box remains unselected, the cropped area is rendered black and the frame edges remain unaffected. If the Reformat check box is selected, the output resolution is forced to the cropped size.

Interview: Dorne Huebler, Industrial Light & Magic, San Francisco

Dorne Huebler graduated from the California Institute of the Arts in 1980. By the time he graduated, he was already creating graphics and visual effects for commercials. In 1995, he served as visual effects supervisor for *James and the Giant Peach*. Since joining ILM in 1998, he's served as a compositor, sequence supervisor, and compositing supervisor on such features as *Harry Potter and the Chamber of Secrets*, *The Chronicles of Riddick*, *Hulk*, *Pirates of the Caribbean: At World's End*, and *Iron Man*.

Dorne Huebler at his workstation. Note the CRT monitors, including one made by SGI.

Industrial Light & Magic (ILM) was founded 1975 in by George Lucas as a means to create the special effects for *Star Wars*. The studio has since gone on to become a powerhouse in the visual effects industry, garnering multiple Academy Awards and a long list of top-grossing feature films. ILM pioneered many of the computer animation and filmmaking technologies taken for granted today, including 24 fps digital video, morphing, and photo-real 3D characters.

(Left) R2-D2 and a storm trooper stand guard over the lobby. (Right) A statue of Eadweard Muybridge, a pioneer of the photographic study of motion, watches over the ILM facility. ILM moved to the Presidio in 2005, restoring the buildings of an abandoned army hospital. (Photos courtesy of Industrial Light & Magic)

(At the time of this writing, ILM was transitioning from Sabre, a modified version of Flame/Inferno, to Nuke.)

LL: You've been involved with visual effects work for close to 30 years—long before the term *digital compositing* was used. Can you describe the route you took to ILM?

DH: While at school at Cal Arts, I was doing graphics for commercials and titles with visual effects.... I didn't run an optical printer. I was prepping [work] for optical printers and art directing [work] with optical printers. So that was my focus in the early 1980s—art direction and design along with animation and film graphics, really. Initially, I was just freelancing for [small companies] in L.A. [T]he first big studio I worked for was Dream Quest Images in the late 1980s. My first feature film was *Superman IV*. I also worked at a place called Chandler Group on *Pee Wee's Playhouse*. I worked for Universal Studios on feature film trailer titles, which was kind of a niche at that point. In the early 1990s, I joined Buena Vista Visual Effects (the early digital effects division of Walt Disney Studios)—that was the real transition into digital compositing. And I worked there until I came to ILM [11 years ago].

LL: Approximately, how many compositors are at ILM at any given time?

DH: It fluctuates based on [the number of] shows that we're working on at once. We might have three to five big shows at once going through here at any time.... The size of the crew will expand and contract based on that. [W]hen I got here in 1998, there were around 20 staff compositors. At present, I'm guessing that there are around 60 to 70 (including freelancers).

LL: Since you joined ILM, you've served as a compositing supervisor. How many compositors would you work with on one project?

DH: I was compositing supervisor for *Star Wars: Episode II*. At one point, we had close to 35 compositors in my group. [A] smaller show may only need 6 to 10 people.... A lot of the times, there are technical directors who will do their own compositing, so you'll work with them as well.

LL: Do you prefer working with the proprietary compositing software or off-the-shelf compositing software?

DH: What I've found is, with every package I use, [I] always find things that I just love.... [E]very package also has idiosyncrasies—like, this is the one thing that bugs me about it. So I think that it's really about the type of work you're doing, [and whether] one program might be more efficient than another. It really depends on what you're up to....

LL: ILM helped popularize the use of HD digital video for feature film work. What has been your own experience with HD in comparison to film?

DH: I'm actually trying to think about the last time I worked on an HD show. I mean, we'll have elements that are shot in HD and it can be really convenient because you don't have to get a film scan. I think it's been three or four years since I've worked on an all-HD show. When you're working with HD, you're going to deal with different green [channel] structure, for instance. It can present challenges for [greenscreen] extractions. But, overall, it's pretty seamless. At the beginning of a show, you think, "Oh my God—it's HD! It's all going to be different!" And then, once you're working, you realize that it's the same as working in film. It's pretty much invisible....

Additional Resources: The Full Interview

To read the full interview with Dorne Huebler, see the Interviews folder on the DVD.

Interview: Michael Coleman, Adobe, Seattle, Washington

Michael Coleman graduated with a degree in business economics from Seattle University. He went on to work as a graphic designer, visual effects artist, and compositor for such companies as Aldus and Will Vinton Studios. In 1999, he joined Adobe and helped redesign the Adobe Creative Suite. In 2007, he became the product manager of After Effects.

Michael Coleman

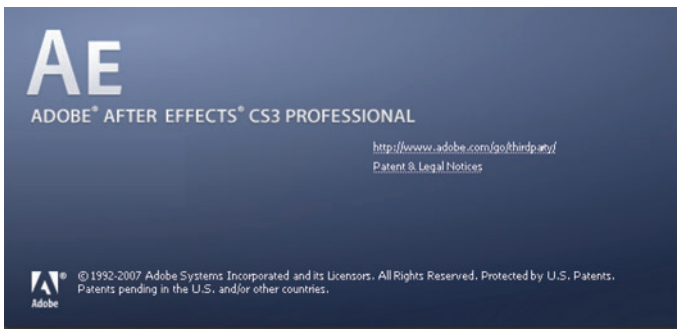
Adobe Systems Incorporated was founded in 1982 by John Warnock and Charles Geschke. Although its initial products were PostScript tools and digital fonts, the company has gone on to develop a wide array of desktop publishing, digital imaging, digital editing, and compositing software. As of 2009, Adobe had grown to over 7,000 employees with offices in San Jose, Seattle, Orlando, and San Francisco as well other cities in the United States and abroad.

LL: What are your duties as product manager?

MC: The product manager position has many facets, but my main responsibility is to define the product strategy and to ensure that After Effects meets our customers' needs. I spend a lot of time talking with customers. It's important that I immerse myself in their concerns, from business trends to the gritty details of production workflows. The After Effects team takes its inspiration from an understanding of what our customers need. Staying close to our customers gives us confidence that every version of After Effects will help our customers be more creative and more productive. If we do this one thing and do it well, everybody wins.

LL: Over its 15-year history, what have been the most significant changes to After Effects?

MC: If you go back and use After Effects 1.0, you can animate your content in nested, hierarchical, high-definition compositions, but you might spend some time looking for the timeline panel. That's because it didn't have one. The timeline came in version 2.0 and would certainly be one of the more significant early changes. Since then, I would say that 3D compositing with cameras, lights, and shadows was a huge leap forward. And 32-bit color, painting tools, and the animation engine for text and shapes have also opened up a universe of creative opportunity....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Adobe

After Effects CS3 logo

LL: There is a great deal of competition when it comes to compositing software. How does After Effects differentiate itself from the pack?

MC: After Effects is surprisingly easy to use and has a great deal of flexibility to handle a broad range of projects. It integrates very well into broader workflows, and it's almost guaranteed that the people you hire already know how to use it.… When it comes to other compositing products, I think you'll find that After Effects is more of a complement than a competitor. If you ask someone who owns another compositing product if they also use After Effects, the answer is probably yes.

LL: After Effects is layer-based. What is the greatest advantage of a layer-based system when compared to a node-based system?

MC: Most people have a mental model of a composite that looks like a stack of layers. The After Effects user interface is organized around a timeline that reflects the stacking order of the layers.… When animation and timing come into play, the advantages of a layered timeline begin to shine. After Effects has the best timeline in the industry, and it's truly a joy to animate with it.… [With After Effects CS4, we] introduced a new feature called the mini-flowchart that visualizes the nesting structure and makes navigating among compositions much faster. It's quite handy and provides some of the advantages of nodes within the layered timeline. Our goal is to have the best of both worlds.

Additional Resources: The Full Interview

To read the full interview with Michael Coleman, see the Interviews folder on the DVD.

Interview: Richard Shackleton, The Foundry, London

Richard Shackleton graduated from the Imperial College of Science, Technology and Medicine in London with a degree in software engineering. He began his career at Nortel Networks and Avid Technology, where he specialized in software development for the visual effects and editing markets. Richard joined The Foundry in 1999 but left to work with Digital Vision. He returned to The Foundry in 2008 and now serves as product manager for Nuke.

The Foundry was founded in 1996 by Bruno Nicoletti and Simon Robinson. The company developed the Tinder plug-in set for Flame and went on to create a wide range of tools for all the major compositing packages. At present, The Foundry is a leading developer of visual effects and image processing technologies for film and video postproduction.

Richard Shackleton

Nuke 5.1 logo

LL: Nuke was developed in-house at Digital Domain. Describe the path it took from Hollywood to The Foundry.

RS: Nuke was [written] as a command-line image-processing program.... [In 1993,] it was used by Digital Domain on the film *True Lies*. The first version, [which] became Nuke 2, was created to read scripts, draw, and show data flow down the tree. It was used for *Titanic* and the *T2* 3D ride along with many other films.... Nuke 4 was the first commercially available version...from the newly-formed D2 Software in 2002.... Selling commercial software is outside Digital Domain's core interests. Both Digital Domain and The Foundry realized that Nuke could have far greater potential if it was developed and marketed by The Foundry. Today, The Foundry owns the Nuke IP (intellectual property).... Digital Domain remains one of The Foundry's most important customers.

LL: Nuke is node based. What is the greatest advantage of a node-based system over a layer-based system? Are there times when a node-based system is a disadvantage?

RS: A node-based system allows you to change earlier operations without having to repeat the later steps manually. It also allows a free flow of operations, whereas a layer-based system will direct an artist's approach to working with a particular application model. Such freedom in constructing the flow of data and operations promotes many advantages, such as intermediate result reuse, the creation of operation templates, more creative and powerful use of scripting and expressions, 3D data flows, and nonimage data use.... A disadvantage is that the program actually does allow such flexibility and may repeat the later steps for you, so this can be slower when you change a step other than the last one. A layer-based system can support a better time-based view, useful when working with multiple shots together in a sequence.

LL: Nuke has always operated in 32-bit floating point. How would you summarize the advantages of floating point over lower, fixed bit depths?

RS: Even in 1993, floating-point calculations were faster than integers on modern processors. Floating point also offers a wider latitude, [which] allows linear data representation rather than having gamma to encode detail in specific areas.... This allows artistic and technical freedom during image processing, [thereby] removing the need to carefully manage clipping in the data. For example, this is useful in color correction (where values are pushed up and down multiple times in succession), with depth or motion data (where great accuracy is needed), and in HDR workflows that need to support a wide range of exposure values.

LL: Nuke is designed for a feature film production environment. Do you consider the core client to be visual effects professionals?

RS: The core client is visual effects professionals, supporting artist and production needs in feature films, commercials, CG animation, and high-value television drama and documentaries.

Additional Resources: The Full Interview

To read the full interview with Richard Shackleton, see the Interviews folder on the DVD.